

## 9. Potential management actions

### 9.1. Prioritisation

Effective management planning requires some prioritisation of use of the available resources. Priority status may be given to different species, river catchments that drive economic investment within the fisheries sector or have specific conservation aims and priority activities that are understood to alleviate primary factors affecting productivity. Other lower priority issues may be considered further as the management process progresses with time.

#### 9.1.1. Prioritisation of species

Along side the species that support fisheries, which are part of the economic and amenity that support local communities, there is also a responsibility to conserve the status of native species, such as salmonids, eels and lamprey. Therefore native species are prioritised within the management strategy and activities over and above that of naturalised or recently introduced coarse fish species. It is also recognised that some coarse fish species, such as pike support economically beneficial fisheries in Argyll.

There may be some different management priorities for species that have a higher conservation value compared those species that may be prioritised for fisheries, but there are also species, such as Atlantic salmon and brown trout that are common to both conservation and fisheries priorities;

*Prioritisation of species for conservation*

High Priority	Medium priority	Low priority
Atlantic salmon	European eel	Minnow
Brown (& sea) trout	Stickleback	Perch
Arctic char		Pike
Powan		Roach
Lamprey species		Rainbow trout

*Prioritisation of species for fisheries*

High Priority	Medium priority	Low priority
Atlantic salmon	Perch	Minnow
Brown (& sea) trout	Roach	Stickleback
Pike	Arctic char	Lamprey species
Rainbow trout	European eel	Powan

The potential resources available for management are likely to be driven by both fisheries and conservation interests.

#### 9.1.1.1 Native species

There is a high priority for salmonid species, particularly Atlantic salmon and brown (& sea-run) trout, which form the focus of local fisheries. The conservation value of Arctic char, powan and lamprey are also a priority for conservation. Currently, the status of other species, such as eels and stickleback are not well understood, although there is some concern that the abundance of eels is reduced compared to historical levels. The availability of resources to invest in management actions for each species is likely to determine the variety management activities undertaken.

The prioritisations of some management actions are different for sea-run salmon and sea trout than for resident brown trout although there are some common priorities which are important to all salmon and trout populations.

*Summary of priorities for management of native species*

<b>Native species</b>	<b>Priorities</b>
Atlantic salmon	Maintain genetic diversity & improve distribution & abundance Maintain & improve existing fisheries Restore non-functioning fisheries
Brown trout	Maintain genetic diversity & improve distribution & abundance Improve local marine survival of sea trout Maintain & improve existing fisheries Restore non-functioning fisheries
Arctic char	Maintain genetic diversity & distribution & abundance
Powan	Maintain genetic diversity & distribution & abundance
Lamprey	Maintain habitats & distribution & abundance
European Eel	Maintain habitats & distribution & abundance
Stickleback	Maintain habitats & distribution & abundance

**Migratory salmonids**

The main priority for conserving and restoring migratory fish populations is to alleviate the marine-based factors associated with the decline of salmon and sea trout populations. The benefits of management actions achievable at a regional level do not realistically extend to the wider North Atlantic and therefore local marine factors affecting survival at sea for salmon and sea trout are a priority.

**Salmon**

The conservation of the variation of genetic, morphological and behavioural aspects of salmon populations in Argyll that underpin the diversity and performance of the fishery is a priority. There is a concern that the productivity of salmon populations may be undermined by the effects of population shrinkage and interbreeding with escaped farm salmon and therefore maintaining genetic diversity is a priority of management.

**Sea trout**

Behavioural differences in the marine phase of the life-cycle of salmon, which migrate to the wider Atlantic Ocean, and sea trout, which utilise inshore marine habitats, require that the management priorities for sea trout are more closely linked to the control of sea lice on marine salmon farms. Therefore, the management of local marine habitats and potential affects of aquaculture are a priority for sea trout.

**Restoration intervention**

Time scales for tackling these causal factors are relatively long and re-establishing abundant fish populations may take many years as the time scale involved in the number of generations of native salmonids (3-5 years per generation) is longer than is desired by all fishery interests. There is also a concern over conserving the remaining gene pool of the native wild populations. Restoration efforts are considered to be a priority in focusing local interest and resources on increasing productivity of the fishery resource. Further to this, the lack of a coordinated, strategic approach to restoration may lead to inappropriate management actions such as indiscriminate stocking of fish from unsuitable sources, undermining the long term recovery of already threatened populations.

**Resident brown trout**

There is an abundance of brown trout populations in Argyll, some of which support sea-run components. The diversity of genetic, morphological and life-history

variation within trout populations is currently little understood, but where studies have been undertaken sub-components of populations, such as ferox trout have been identified as being worthy of conservation status. Understanding this diversity is a priority if these components are to be conserved in the longer term.

#### Arctic char

Argyll hosts a number of char populations, one of which in Loch Awe has been identified for conservation status due to the presence of genetically and morphologically distinct autumn and spring spawning components. Identifying and conserving such diversity is a priority for management of char populations.

#### Powan

There is only a single population of powan in Argyll, which inhabit Loch Eck alongside Arctic char, which is the only known location in Scotland where this unique fish community exists. Identifying and maintaining habitats important to the ecology of this community is a priority for conservation.

#### Lamprey

The National Lamprey Survey identified a number of brook, river and sea lamprey populations in Argyll. Identifying and maintaining key habitats for juvenile production will be a priority for conserving the diversity of lamprey populations in Argyll.

#### European eel

Although not specifically targeted by fisheries, eel populations are an important part of the fish community in Argyll, supporting a wealth of other fish, mammal and bird species. Declines in eel populations noted across Europe indicate that management is a priority for supporting local biodiversity.

#### Stickleback

Three and nine-spined stickleback are present throughout many of Argyll's freshwater habitats, but little is known of their status or importance to the general fish community. Developing an understanding of their role in the ecology of aquatic habitats is a priority for these species.

#### 9.1.1.2. Introduced species

The distribution of most non-native species, such as perch, pike and roach is limited to a small number of habitats in Argyll. The exception is the minnow, which is commonly present in many river and loch systems, distributed by anglers and fishery owners as live bait and forage fish respectively. Preventing the spread of non-native species that compete for limited resources with native fish is a major priority for management. Similarly, escapee rainbow trout from culture units are a burden on the limited resources available and therefore farm site containment is a priority for conserving productivity of native fish populations. Currently, there are a small number of fisheries focused on pike populations that contribute to the local economy. If these fisheries are to be profitably maintained, controlling exploitation will be a priority.

Other species	Priorities
Pike, perch & roach	Maintain & improve existing fisheries Minimise potential for expansion of distribution
Minnow	Minimise potential for expansion of distribution
Rainbow trout	Minimise potential for competition with native species Minimise potential for disease & parasites

**9.1.2. Freshwater habitats**

Common to all freshwater fish species, maintaining and improving the accessibility and quality of freshwater habitats is a priority if the optimal productivity of fish populations and performance of fisheries is to be attained.

Habitat	Priorities
River (fluvial)	Restore & maintain access for migratory species Maintain & improve productivity of habitats Prevent unsustainable use of land & water resources
Loch (lacustrine)	Maintain & improve productivity of habitats Prevent unsustainable use of land & water resources
Inshore marine	Minimise potential for interaction with aquaculture

**9.1.3. Fisheries**

In terms of fisheries, short-term priorities for management are conservation and restoration of recognised fisheries, while the development of potential fisheries is considered to be a longer-term ambition. The restoration of existing significant fisheries may be further prioritised in the short-term by focusing on those fisheries that are potentially open to the public, which are of most benefit to the local economy, while private fisheries may be prioritised on the basis of where resources are made available.

Priority	No.	Description
High	29	Significant salmon & trout fisheries with economic potential Significant commercial fisheries for non-native species
Medium	42 Var.	Potential salmon & trout fisheries Potential & existing hill loch fisheries for brown trout
Low	66	Potential sea trout fisheries (including watercourses that may support coastal fisheries)

The current status of the fisheries is described in terms of management and current activity;

Fishery status	Description
Restoration	Fishery restoration plan developed & actively progressed
Managed	Fishery active with active management initiatives underway
Unmanaged	Fishery active, but no active management group
Accessible	Fishery currently open to angling activity
Restricted	Fishery currently in-active or limited to owners only

Argyll Fisheries Trust, Part 9 – Potential Management Actions

High Priority fisheries

A total of 29 fisheries in Argyll are identified as being historically active with high potential as productive fisheries.

Management Unit	Catchment	Species	Fishery status
<b>A. Loch Linnhe &amp; Firth of Lorn</b>	R. Creran	Salmon & trout	Restoration - restricted
	R. Etive	Salmon & trout	Managed - restricted
	R. Kinglass	Salmon & trout	Managed - restricted
	R. Awe / Orchy	Salmon & trout	Managed - accessible
	Loch Awe	Brown trout	Managed - accessible
		Coarse fish	Managed - accessible
<b>B. Lower Firth of Lorn</b>	R. Nell	Salmon & trout	Managed - accessible
	R. Euchar	Salmon & trout	Managed - accessible
	R. Add	Salmon & trout	Managed - accessible
<b>C. Kintyre</b>	Barr Water	Salmon & trout	Managed - accessible
	Machrihanish	Salmon & trout	Unmanaged - accessible
	Glenlussa W.	Salmon & trout	Managed – accessible
	Carradale W.	Salmon & trout	Managed - accessible
<b>D. Loch Fyne</b>	R. Kinglas	Salmon & trout	Restoration - restricted
	R. Fyne	Salmon & trout	Restoration - restricted
	R. Shira	Salmon & trout	Restoration - restricted
	R. Aray	Salmon & trout	Restoration - restricted
<b>E. South Argyll</b>	R. Ruel	Salmon & trout	Managed - accessible
	R. Eachaig	Salmon & trout	Managed - accessible
	R. Goil	Salmon & trout	Managed – accessible
	Loch Fad	Rainbow trout	Managed - accessible
<b>F. Isle of Mull</b>	R. Aros	Salmon & trout	Managed - accessible
	R. Forsa	Salmon & trout	Managed - accessible
	R. Lussa	Salmon & trout	Managed – restricted
	R. Ba	Salmon & trout	Managed - accessible
<b>G. Islay &amp; Jura</b>	R. Laggan	Salmon & trout	Managed - accessible
	L. Gorm	Brown trout	Managed - accessible
<b>H. Isle of Arran</b>	Iorsa Water	Salmon & trout	Managed – restricted
	Machrie W.	Salmon & trout	Managed – restricted
	Glenrosa W.	Salmon & trout	Managed – restricted

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Medium priority fisheries

Unit	Catchment	Species	Fishery status
<b>A. Loch Linnhe &amp; Firth of Lorn</b>	R. Nant	Salmon & trout	Managed - accessible
	R. Noe	Salmon & trout	Managed – restricted
	R. Liver	Salmon & trout	Managed – restricted
	Loch Avich	Brown trout	Managed - accessible
	Hill lochs (var.)	Brown trout	Unmanaged – accessible
	Inverawe	Rainbow trout	Managed - accessible
<b>B. Lower Firth of Lorn</b>	Barbreck R.	Salmon & trout	Unmanaged - restricted
	R. Oude	Salmon & trout	Unmanaged - accessible
	Kilmelford lochs	Brown trout	Managed – accessible
	Hill lochs (var.)	Brown trout	Unmanaged - accessible
<b>C. Kintyre</b>	Ormsary W.	Salmon & trout	Unmanaged - restricted
	Bardaravine R.	Salmon & trout	Unmanaged - unknown
	Clachan Burn	Salmon & trout	Unmanaged - accessible
	Breackerie W.	Salmon & trout	Managed - accessible
	Conieglen W.	Salmon & trout	Managed - accessible
	Saddell W.	Salmon & trout	Unmanaged - restricted
	Claonaig W.	Salmon & trout	Managed - restricted
	Skipness R.	Salmon & trout	Unmanaged - unknown
	Hill lochs (var.)	Brown trout	Unmanaged - accessible
<b>D. Loch Fyne</b>	Auchalick R.	Salmon & trout	Managed - restricted
	Kilfinan R.	Salmon & trout	Managed - restricted
	Douglas W.	Salmon & trout	Managed - restricted
	Leacann W.	Salmon & trout	Managed - restricted
	Hill lochs (var.)	Brown trout	Unmanaged - accessible
<b>E. South Argyll</b>	Loch Tarsan	Brown trout	Managed – accessible
	Ardyne Burn	Salmon & trout	Managed - restricted
	Little Eachaig	Salmon & trout	Managed - restricted
	Glen Finart B.	Salmon & trout	Managed - restricted
	Croe Water	Salmon & trout	Unmanaged - accessible
	Loin Water	Salmon & trout	Unmanaged - accessible
	Hill lochs (var.)	Brown trout	Unmanaged - accessible
<b>F. Isle of Mull</b>	Coilador River	Salmon & trout	Managed - restricted
	Bunessan River	Salmon & trout	Managed - restricted
	R. Bellart	Salmon & trout	Unmanaged - accessible
	Mingary Burn	Salmon & trout	Unmanaged - accessible
	Hill lochs (var.)	Brown trout	Unmanaged - accessible
<b>G. Islay &amp; Jura</b>	R. Sorn	Salmon & trout	Managed - restricted
	River Leoig	Salmon & trout	Unmanaged - accessible
	Kilbride River	Salmon & trout	Unmanaged - accessible
	Carrabus Burn	Salmon & trout	Unmanaged - accessible
	Crackaig River	Salmon & trout	Unmanaged - accessible
	Glenpatrick R.	Salmon & trout	Unmanaged - accessible
	Shian River	Salmon & trout	Unmanaged - accessible
	Hill lochs (var.)	Brown trout	Unmanaged - accessible
<b>H. Isle of Arran</b>	N. Sannox W.	Salmon & trout	Managed - accessible
	Sannox Water	Salmon & trout	Managed - accessible
	Kilmory Water	Salmon & trout	Managed - accessible
	Sliddery Water	Salmon & trout	Managed - accessible
	Black Water	Salmon & trout	Managed - accessible
	Hill lochs (var.)	Brown trout	Managed - accessible
<b>I&amp;J. Coll &amp; Tiree</b>	Hill lochs (var.)	Brown trout	Unmanaged - accessible

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Low Priority fisheries

A total of 68 fisheries in Argyll are identified as being of lower potential as productive fisheries. Currently there is relatively little information on the fish populations in this category of fisheries.

Unit	Catchment	Species	Fishery status
<b>A. Loch Linnhe &amp; Firth of Lorn</b>	Stockdale	Salmon & trout	Unmanaged - unknown
	An lola	Sea trout	Unmanaged - unknown
	Abhainn Teithil	Sea trout	Unmanaged - unknown
	Dearg Abhainn	Sea trout	Unmanaged - unknown
	Esragan Burn	Sea trout	Unmanaged - unknown
	Abhainn Dalach	Sea trout	Unmanaged - unknown
	Allt Easach	Sea trout	Unmanaged - unknown
	Allt Coire	Sea trout	Unmanaged - unknown
	Allt Ghiusachan	Sea trout	Unmanaged - unknown
	Lusragan Burn	Sea trout	Unmanaged - unknown
<b>B. Lower Firth of Lorn</b>	Black Lynn B.	Sea trout	Unmanaged - unknown
	Allt Chriche	Sea trout	Unmanaged - unknown
	Allt Dallermaig	Sea trout	Unmanaged - unknown
	A. na Cille	Sea trout	Unmanaged - unknown
<b>C. Kintyre</b>	Linne Burn	Sea trout	Unmanaged - unknown
	The Lussa	Sea trout	Unmanaged - unknown
	Allt Cinn-locha	Sea trout	Unmanaged - unknown
	Barranlongart	Sea trout	Unmanaged - unknown
	Crear Burn	Sea trout	Unmanaged - unknown
	A.L.an Uinnsinn	Sea trout	Managed - restricted
	A. nan Gillean	Sea trout	Unmanaged - unknown
	A. na Cuile	Sea trout	Unmanaged - unknown
	Bardaravine R.	Sea trout	Unmanaged - unknown
	Ballochroy Burn	Sea trout	Unmanaged - unknown
	Killean Burn	Sea trout	Unmanaged - unknown
	Allt Beachaire	Sea trout	Unmanaged - unknown
	Clachaig Water	Sea trout	Unmanaged - unknown
	Tangy Burn	Sea trout	Unmanaged - unknown
Smerby Burn	Sea trout	Unmanaged - unknown	
Strone Water	Sea trout	Unmanaged - unknown	
<b>D. Loch Fyne</b>	Stronchullin B.	Sea trout	Unmanaged - unknown
	Inverneil Burn	Sea trout	Unmanaged - unknown
	Cuilarstich Burn	Sea trout	Unmanaged - unknown
	Abhainn Mhor	Sea trout	Unmanaged - unknown
	Strathlachlan	Sea trout	Unmanaged - unknown
	Lephinmore B.	Sea trout	Unmanaged - unknown
	Lephinchapel B.	Sea trout	Unmanaged - unknown
	Kilail Burn	Sea trout	Unmanaged - unknown
	Allt Osda	Sea trout	Unmanaged - unknown
Crarae Burn	Sea trout	Managed - restricted	
<b>E. South Argyll</b>	Tamhnich Burn	Sea trout	Unmanaged - unknown
	Inverneil Burn	Sea trout	Unmanaged - unknown
	Balliemore Burn	Sea trout	Unmanaged - unknown
	Glentarsan B.	Sea trout	Unmanaged - unknown
	Invervegain B.	Sea trout	Unmanaged - unknown
	Inverchaolain B.	Sea trout	Unmanaged - unknown
	Balgaidh Burn	Sea trout	Unmanaged - unknown

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	Milton Burn Stronchullin B. Coilessan Burn Lettermay Burn	Sea trout Sea trout Sea trout Sea trout	Unmanaged – unknown Unmanaged - unknown Unmanaged - unknown Unmanaged - unknown
<b>F. Isle of Mull</b>	Tobermory R. More to add?	Sea trout	Unmanaged - unknown Unmanaged - unknown
<b>G. Islay &amp; Jura</b>	Kintour River Claggain River A.na h-Uainaire A. Ghlean A.L. a Mhuillin	Sea trout Sea trout Sea trout Sea trout Sea trout	Unmanaged - unknown Unmanaged – unknown Unmanaged - unknown Unmanaged - unknown Unmanaged - unknown
<b>H. Isle of Arran</b>	Glencloy Burn Benlister Burn Monamore Burn Glenashadale B Abhainn Mhor Chalmadale W.	Sea trout Sea trout Sea trout Sea trout Sea trout Sea trout	Unmanaged - unknown Unmanaged – unknown Unmanaged - unknown Unmanaged - unknown Unmanaged - unknown Unmanaged - unknown
<b>I. Tiree</b>	Loch a Phuill L.B. Crossapol L.An Fhaodhail	Sea trout Sea trout Sea trout	Unmanaged - unknown Unmanaged – unknown Unmanaged - unknown
<b>J. Coll</b>	Var. hill lochs	Brown trout	Unmanaged - unknown

#### 9.1.4. Management priorities

The management priorities for Argyll include both fisheries of high potential and native species conservation. The priority status and management priorities used to describe the status of fisheries are defined below;

Priority status	Description
Threatened	Loss of distribution & severe decrease in abundance
Major fishery	Economically important & active fishery
Managed fishery	Active fishery with local management group
Unmanaged fishery	Active fishery with no local management group
Species Management	Non-fishery target species with high conservation value

Management Priority	Description
Restoration	Priority for active restoration initiatives
Management	Development & improvement of management initiatives
Stocking scheme	Stocking programme underway requiring guidance
Mixed-stock fishery	Active coastal net fishery
Intensive fishery	Active fishery with no catch restrictions
Conservation	Maintaining species distribution & abundance of priority species

Argyll Fisheries Trust, Part 9 – Potential Management Actions

The management priorities for the fisheries with highest potential and for species conservation are described;

<b>Priority status</b>	<b>Catchment</b>	<b>Species</b>	<b>Management priority</b>
<b>Threatened</b>	R. Creran	Salmon & trout	Restoration priority
	R. Kinglas	Salmon & trout	Restoration underway
	R. Fyne	Salmon & trout	Restoration underway
	R. Shira	Salmon & trout	Restoration underway
	R. Aray	Salmon & trout	Restoration underway
	R. Ruel	Salmon & trout	Restoration priority
	Eachaig	Salmon & trout	Restoration priority
<b>Major fishery</b>	R. Awe / Orchy	Salmon	Management priority
	Loch Awe	Salmon	Management priority
		Brown trout	Management priority
<b>Managed fishery</b>	R. Etive	Salmon & trout	Stocking programme
	R. Kinglass	Salmon & trout	Stocking programme
	R. Nell	Salmon & trout	Mixed-stock fishery
	R. Euchar	Salmon & trout	Mixed-stock fishery
	R. Add	Salmon & trout	Intensive fishery
	Barr Water	Salmon & trout	Intensive fishery
	Glenlussa W.	Salmon & trout	Intensive fishery
	R. Goil	Salmon & trout	Intensive fishery
	R. Aros	Salmon & trout	Stocking programme
	R. Forsa	Salmon & trout	Stocking programme
	R. Ba	Salmon & trout	Stocking programme
	R. Laggan	Salmon & trout	Stocking programme
	L. Gorm	Brown trout	Intensive fishery
	Iorsa Water	Salmon & trout	Stocking programme
	Machrie W.	Salmon & trout	Stocking programme
Glenrosa W.	Salmon & trout	Stocking programme	
<b>Unmanaged fishery</b>	Machrihanish W.	Salmon & trout	Intensive fishery
<b>Species management</b>	Loch Eck	Powan & char	Conservation
	Loch Awe	Char	Conservation
	Loch Seil	Char	Conservation
	Kilmelford Lochs	Char	Conservation

## 9.2. Management Strategies

The management strategy employed will have an important role in establishing the effectiveness of restoration of Argyll's fisheries and maintaining the long-term sustainability of the resource. The strategy will also be important in best utilising the limited resources available for management and therefore activities best undertaken at both the regional and local level require identification.

### 9.2.1. Strategy for developing management framework

A holistic and comprehensive approach to management will require engagement with other authorities and management groups whose management roles and activities are not specific to fisheries, but have the ability to promote productivity in aquatic environments. Increasingly, legislative and planning processes are being developed by agencies and local authorities, all of which require in-put from fishery management if the potential benefits are to be realised. Within the fisheries sector, a joined-up management structure is required to transfer information and skills through local, regional, national and international management groups. Some aspects of the roles of management will be shared, particularly at the local and regional levels.

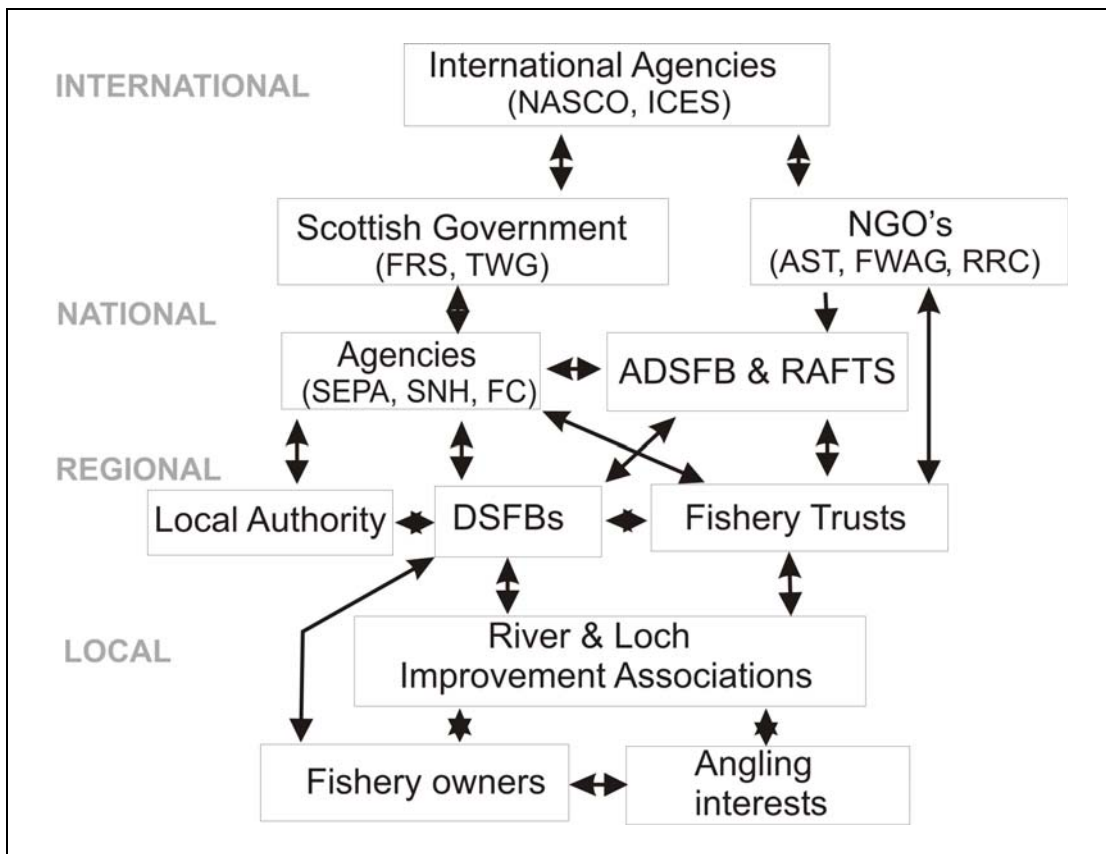


Fig.? Information pathways through management structure for Argyll

The existing management structure operating in Argyll has undergone a recent transformation by the establishment of the Argyll District Salmon Fishery Board, which has subsumed a number of smaller fishery boards. River and Loch Improvement Associations have also been developed to facilitate management at a local level.

### 9.2.2. Regional management strategy

At the regional level, the District Salmon Fishery Boards provide a structure for implementing fishery management administration and protect the fisheries resource. Representation of local groups on the Fishery Board provides further opportunity for information transfer, between the national and local management levels. Guidance on regional & local management and improvement activities are provided by the Fishery Trust through the development of River management & Fishery Restoration Plans, which source information from centres of expertise.

The regional level of management offers opportunity to engage with other management groups to achieve larger scale improvements than possible on a local scale.

#### *Summary of Regional management groups & general remits*

Species	Priority Limiting factors	Priority Management Groups
Salmon & sea trout	Local marine survival	Tripartite Working Group (TWG) Area Management Groups (AMGs) Scottish Salmon Growers Assoc (SSGA)
All species	Use of land & water resources	Water Framework Directive (WFD) Scottish Natural Heritage (SNH) Argyll Agriculture Forum (AAF) Forestry Commission (FC) Scottish Environment Protection Agency (SEPA) Local Biodiversity Action Group (LBAG) Argyll & Bute Council (A&BC) Scottish & Southern Energy Plc (SSE) Renewable Energy Developers (RED) Scottish Water Plc (SW)
Salmon & sea trout	Exploitation of stocks	District Salmon Fishery Boards (DSFBs) River Improvement Associations (RIAs)
Brown trout	Exploitation of stocks	Loch Improvement Associations (LIAs)

A regional approach to mitigation of common factors affecting the performance of Argyll's fisheries is essential to the management process, while other locally driven activities require guidance from centres of expertise. There are a number of common tasks to be tackled at the regional level if management and restoration aims are to be realised in the longer term;

#### *Summary of Regional Management Strategy*

Item	Objective	Strategies
<b>A</b>	Identify the requirements and factors underpinning productivity of fisheries	1. Identify fish population structures 2. Improve Understanding of fish ecology 3. Improve management of ecosystems
<b>B</b>	Improve Management of the fishery resource	1. Improve regional fisheries administration 2. Control exploitation of fish resources 3. Develop & support improvement initiatives
<b>C</b>	Improve management of land and water resources across the region	1. Minimise potential impacts of Aquaculture 2. Improve management of water resources 3. Improve management of land resources
<b>D</b>	Engage wider management considerations	1. Prevent decline of productivity 2. Raise awareness of fishery issues 3. Improve quality of data collection
<b>E</b>	Develop fisheries management at a local scale	1. Develop catchment scale planning 2. Maintain & improve fish habitats 3. Improve accessibility of habitats

**A. Identify the requirements of fish populations and factors underpinning productivity of fisheries** – Improving management of wild fish populations and fisheries will require further information on fish biology and ecology.

**A1. Identify fish population structures** – Expression of genetic variation within and between fish populations are understood to underpin the productivity and diversity of the fishery.

**Genetic issues & challenges**

- Limited existing information on genetic structures in native fish populations
- Limited information of life history & behavioural differences
- Possible erosion of existing structures by ingress of escapee farmed fish and stocking of non-natal fish
- Funding research

**Strategy** – Work with centres of expertise to;

- a. Identify the genetic structures & effective population size of priority species
- b. Understand the life-history & behavioural traits associated with genetic sub-components
- c. Identify & protect vulnerable sub-components
- d. Translate genetic information into all aspects of management of the resource

**A2. Improve Understanding the fish ecology** - The decline of fisheries in Argyll highlights that improvement in our knowledge and management is required.

**Understanding the resource issues & Challenges**

- Patchy information on fish populations at a regional scale
- Patchy information on fish habitats at a regional scale
- Patchy information on fish access to habitats at a regional scale
- Limited information on native species other than salmonids

**Strategy** – Long-term planning & coordination is required to;

- a. Identify priority species and key habitats and life-stages where knowledge is required
- b. Estimate the resources required to collect and evaluate the information
- c. Translate the information into all aspects of management of the resource

**A3. Improve management of aquatic ecosystems** – Improvement of fisheries will require engagement with wider-conservation interests to maximise potential benefits of habitat management and manage potential conflicting conservation issues, such seals, European beaver and piscivorous birds.

**Conservation issues & challenges**

- Limited fisheries interaction with wider conservation interests
- Limited awareness of potential activities that will benefit fisheries
- Some protected species may contribute to decreases in fish abundance
- Activities of other resource users may maintain artificially high predator numbers

**Strategy** – Engage with conservation interests to improve management

- a. Identify priority issues & key locations where collaborative working is of benefit
- b. Identify priority issues where conflictive wildlife conservation issues may arise
- c. Identify locations where escaped farm fish may support high predator numbers
- d. Engage with management groups to improve common aspects of management

**B. Improve Management of the fishery resource** - There are a number of tasks required to inform and improve fisheries management on a regional scale.

**B1. Improve regional fisheries administration** - Communications between local and national management levels are essential to improving fishery management.

**Fisheries administration issues & challenges**

- Fragmented structure of fishery management bodies at the regional scale
- Limited distribution of local management groups
- Conflicting management of migratory and non-migratory fish species
- Mix of attitudes at a local level toward regional fishery management policy

**Strategy** – Establish a streamlined, all species management framework for Argyll;

**a.** Streamline fisheries management structure in Argyll

**b.** Pursue an all species remit

**c.** Pursue the development of a full network of local management groups

**d.** Establish a pathway for flow of information between management groups/levels

**B2. Control exploitation of fish resources** – Fisheries have the potential to over-exploit vulnerable fish populations, undermining the aims of conservation and restoration. Guidance from regional & national management levels is necessary to control exploitation of the resource at a local level.

**Controlling exploitation issues & challenges**

- Continued exploitation of mixed-stock fisheries
- Limited information on vulnerable fish populations
- Competitive element within some fisheries exacerbates exploitation
- Lack of awareness of effective catch & release technique amongst anglers
- Use of hatcheries to justify maintaining high levels of exploitation

**Strategy** – Work with fisheries interests and centres of expertise to;

**a.** Develop understanding of the benefits of maximising spawning escapement

**b.** Demonstrate the benefits of conservation management policies

**c.** Manage expectations from fishery owners, managers and users

**B3. Develop & support regional improvement initiatives** - A number of fisheries undertake management activities to improve fisheries. Input from centres of expertise can improve effectiveness and avoid inappropriate actions.

**Improvement Initiatives issues & challenges**

- Limited coordination on current activities
- Some activities are poorly informed
- Some initiatives are not effective
- Some initiatives may undermine the long-term health of the fisheries resource

**Strategy** – Work with fishery interests and centres of expertise to;

**a.** Identify common opportunities where improvement initiatives may be beneficial

**b.** Find resources to develop & support region-wide improvement initiatives

**c.** Utilise best-practice techniques advised by centres of expertise

**d.** Monitor affects of initiatives on fish populations and fisheries

**C. Improve management of land and water resources across the region.**

**C1. Minimise potential impacts of Aquaculture related activities** – Culture of farmed fish has the potential to affect the productivity of native fish populations, particularly migratory fish

**Aquaculture management issues & challenges**

- Potential for post-smolt survival of salmon and sea trout to be reduced
- Potential for the introduction of disease vectors through aquaculture
- Potential for escaped farmed salmon fish to undermine productivity of wild fish
- Potential for fish farms to maintain unnaturally high numbers of predators

**Strategy** – Develop Area Management Agreements;

- a. Engage with aquaculture sector to better understand the aquaculture related issues affecting wild fish
- b. Improve health status of farmed and wild fish in relation to the AMA
- c. Minimise interaction of farmed and wild fish
- d. Reduce potential impact of predators to farmed & vulnerable wild fish populations

**C2. Improve management of water resources** - The use of freshwater resources for hydro-electric generation, water supply and discharge from sewage treatment works have potential to affect the productivity of freshwater resources.

**Water resources issues & challenges**

- Potential for dewatering of fish habitats
- Potential for hampering of fish movement
- Potential for disruption of in-stream substrate transport (fluvial processes)
- Potential for pollution from sewage disposal

**Strategy** – work with resource users and SEPA to;

- a. Prevent inappropriate & unsustainable developments
- b. Review the sustainability of current activities through the WFD process
- c. Understand affects of water use on fish populations & habitats
- d. Raise awareness of issues related to fisheries with resource users

**C3. Improve management of land resources** - Common land use activities such as forestry and agriculture can impact on the productivity of freshwater habitats and fishery performance.

**Land management issues & challenges**

- Lack of awareness of the potential affects of land usage on fish habitats
- Lack of fishery sector engagement with land users
- Lack of resources and specific forums to engage with land users
- Less than optimal use of current incentives to improve riparian land use

**Strategy** – work with land managers minimise potential impacts on fisheries

- a. Engage with land users through management forum
- b. Assess the sustainability of current activities through the WFD process
- c. Understand affects of land use on fish populations & habitats
- d. Raise awareness of issues related to fisheries with resource users

#### **D. Engage wider management considerations**

There a number of other factors that has the potential to undermine management initiatives which require fishery interests to be pro-active such as the potential introduction and spread of alien species and gaining the support of the other management sectors and the general public to promote conservation of the resource.

**D1. Prevent decline of productivity** - Introductions of alien species, diseases and parasites have the potential to compete for resources with native species and can impact on productivity of fisheries and natural biodiversity.

##### **Bio-security issues & challenges**

- Limited understanding of potential impacts by general resource users
- Potential for introduction of alien species & fish diseases and parasites
- Potential for existing alien species to become widespread
- Lack of resources for controlling established alien flora

**Strategy** – work with relevant stakeholders to;

- a. Engage other management sectors to produce a strategy for management
- b. Support development of a multi-sector Bio-Security Management Plan for Argyll
- c. Prioritise alien species, diseases and parasites according to threats posed
- d. Identify potential pathways for introduction and spread of undesirable species
- e. Support catchment-wide plan for removal of alien flora and fauna at a local scale

**D2. Raise awareness of fishery issues** - The participation of all stakeholders in the management of aquatic habitats can help to ensure cooperation of resource users, local and national decision makers and participate in conservation initiatives.

##### **Biodiversity issues & challenges**

- Lack of general awareness of biodiversity issues in fisheries sector
- Low priority of biodiversity issues amongst other management sectors
- Providing resources to support biodiversity issues

**Strategy** – Engage stakeholders to support conservation of aquatic biodiversity;

- a. Identify and inform stakeholders through management forums
- b. Engage with the objectives of the Local Biodiversity Action Plan
- c. Support activities to raise awareness amongst the general public
- d. Maximise potential benefits of the Water Framework Directive

**D3. Improve quality of data collection** – Effective fishery management requires high quality information on the status of the resource.

##### **Survey data issues & challenges**

- Limited resources available for developing survey techniques
- Limited range of survey protocols currently established
- Limited understanding & interpretation of data collected
- Limited information on productivity on a variety of habitat types

**Strategy** – Continue development of survey protocols with centres of expertise

- a. Where required, develop new & existing monitoring techniques & protocols
- b. Ensure monitoring protocols provide the information required & are cost effective
- c. Develop monitoring tools & protocols for local fishery managers

### 9.2.3. Local management strategy

The management process at a local level will require information collected at the catchment scale to inform regional and local management groups. The management structures need to be further developed at a scale best suited to deliver the changes at a single or collective of adjacent catchments within a management unit. Establishing full management representation across the region will be essential to providing support for management activities. The approach to management at the local level may also differ between management units depending on the status of the resource.

The assessment of the fisheries resources and delivery of fishery management advice requires in-put from the regional and sometimes national management scale and therefore communication between these management groups is essential. Many aspects of management are common to many local management groups, which are summarised in the points below;

**E. Develop fisheries management at the local scale** – Regional management groups have the potential to support local focus groups;

**E1. Develop catchment scale planning** - to guide management activities and engage all resource users into the management process.

#### **Catchment scale planning issues & challenges**

- Providing resources for restoration initiatives at a catchment level
- Poor definition of restoration targets
- Lack of knowledge of conservation & restoration activities at a local level

**Strategy** – Develop plans with local fisheries interests;

- a. Provide a framework for management planning & obtaining resources
- b. Identify & Prioritise effective management activities in priority catchments
- c. Link management activities with other management initiatives (LBAP, WFD).
- d. Avoid inappropriate management activities.

#### **E2. Maintain and improve the quality of fish habitats**

By maximizing the potential productivity of fish habitats it is possible to make improvements in fish abundance over current levels and help support sustainable fisheries.

#### **Managing habitats issues & challenges**

- Lack of catchment specific information on river processes
- Historical legacy of inappropriate land & water use
- Lack of information on quality of fish habitats in many catchments
- New developments of land & water resources
- Lack of catchment-wide management of land and water resources

**Strategy** – Work with relevant stakeholders and centres of expertise to;

- a. Undertake surveys of fish habitats in all priority catchments
- b. Protect habitats from inappropriate development
- c. Engage with Water Framework Directive initiatives to improve ecological status
- d. Raise awareness and stimulate change amongst land & water resource users

**E3. Improve accessibility of all potential habitat** - Improving the accessibility of productive habitats it is possible to support and optimise fishery performance.

**Fish access issues & challenges**

- Some habitat may be rendered inaccessible by man-made obstacles
- Some structures may hamper movement of fish in low flow / temperatures
- Dewatering of habitats during key periods by other resource users

**Strategy** – Assess and alleviate problem obstacles;

- a. Identify obstacles to accessibility of priority catchments
- b. Estimate losses to productivity associated with obstacles
- c. Prioritise resources to support removal of obstacles
- d. Work with relevant stakeholders to secure resources to undertake removal

### 9.3. Expectations from management solutions

The management solutions proposed at a local and regional level are expected to deliver a number of benefits to fish populations and fishery performance;

#### A. Identify factors underpinning productivity of fisheries

##### A1. Identify fish population structures - Expectations

- a. Understand genetic sub-components of priority species across the region
- b. Understand life-history & behavioural traits to sub-components
- c. Establish estimates abundance & identify vulnerable sub-components
- d. Assess exploitation of sub-components by fisheries
- e. Inform management process at national, regional & local scales

##### A2. Improve understanding of fish ecology - Expectations

- a. Be aware of trends in abundance of priority species across the region
- b. Understand variation in life-history for priority species
- c. Understand factors limiting productivity of priority species
- d. Translate Information into the management process

##### A3. Improve management aquatic ecosystems - Expectations

- a. Increased cooperation between wildlife conservation interests
- b. Increased funding opportunities for fisheries to contribute to conservation
- c. Undertake initiatives to minimise conflicting conservation goals
- d. Raised awareness of fisheries role in managing aquatic ecosystems

#### B. Improve Management of the fishery resource

##### B1. Improve fisheries administration & communications - Expectations

- a. Have an effective structure for fisheries management to reduce administrative costs and promote professionalism within the fisheries sector
- b. Have an inclusive 'all species' remit will promote conservation goals
- c. Support a complete network of local management groups will avoid mismanagement of the resource
- d. Improved flow of information will increase awareness of priority issues

##### B2. Control exploitation of fish resources - Expectations

- a. Increased awareness of benefits of improving spawning escapement amongst fishery interests
- b. Demonstrating benefits of increased egg deposition will support strategy
- c. Providing estimates of productivity will maintain realistic expectations of the resource

##### B3. Regional improvement Initiatives - Expectations

- a. Increased effectiveness of improvement initiatives across the region
- b. Maximum benefit realised from available resources
- c. Wide-spread use of best-practice techniques advised by centres of expertise
- d. Increased understanding of affects of initiatives on fish populations and fisheries

**C. Improve management of land and water resources.**

**C1. Aquaculture management - Expectations**

- a. Improved understanding of the aquaculture related issues affecting wild fish
- b. Improved health status of farmed and wild fish
- c. Reduced incidence of escapes of farmed fish & sea lice abundance
- d. Reduced impact on genetic fitness of wild salmon from escape events
- e. Improved management of predator abundance supported by farmed fish

**C2. Improve management of water resources - Expectations**

- a. Prevention of inappropriate & unsustainable developments
- b. Reduced impact of existing developments
- c. Improved knowledge of affects of resource usage
- d. Increase awareness of resource users
- e. Improved communications with resource users

**C3. Improve management of land usage - Expectations**

- a. Raised awareness of land users of their role of conserving fish habitats
- b. Improved general standards of management through the WFD process
- c. Improved understanding of habitat productivity at a variety of land usage sites
- d. Improved communications with resource users
- e. Improved productivity of key habitats for priority species

**D. Engage with wider management considerations**

**D1. Prevent decline in productivity - Expectations**

- a. Identification of existing and potential threats through the development of a Bio-Security Management Plan for Argyll
- b. Identification of alien species presence and distribution
- c. Identification of pathways of diseases and parasite introduction and spread
- d. Raise awareness of potential pathways for introduction and spread of undesirable species
- e. Information translated into fishery management planning and management

**D2. Raise awareness of fishery issues - Expectations**

- a. Established communications between resource users focused on improvements
- b. Established activities between resource users to promote improvement
- c. Region-wide public relations activities & information distribution
- d. Improved awareness of the general public

**D3. Improve the quality of data - Expectations**

- a. Wider range of information collected on more species and life-stages
- b. Improved utility of existing monitoring techniques & protocols
- c. Improved cost effectiveness of survey programmes
- d. High quality of information available to make informed management decisions
- e. Improved opportunities for local fishery managers to support data collection

**E. Support and develop fisheries management at the local scale** – Local management groups are expected to undertake core management tasks, which are informed by the regional and national management groups;

**E1. Develop catchment scale planning - Expectations**

- a. Have a framework for management planning & obtaining resources
- b. Prioritisation of factors limiting productivity
- c. Sustain activities to address factors limiting productivity
- d. Have a realistic time-scale for achieving management aims.
- e. Participation of all other interests in catchment scale management

**E2. Maintain and improve freshwater habitats - Expectations**

- a. Have a catchment-specific habitat management strategy for priority fisheries
- b. Established identification & improvements of all factors affecting productivity
- c. Have habitat survey & water quality data of all priority habitats
- d. Have established local links to the other management initiatives (LBAP, WFD)

## 9.4. Solutions

A number of solutions are identified to achieve the objectives of management at a regional and local level.

### A. Identify factors underpinning productivity of fisheries

#### A1. Identify, maintain & manage fish population structures

##### Develop and fund a region-wide genetic research & management programme

- |   |
|---|
| <i>a.</i> Collect genetic information to identify genetic structuring of priority species |
| <i>b.</i> Collect information on life-history & behavioural traits of priority species    |
| <i>c.</i> Provide estimates abundance & identify vulnerable sub-components                |
| <i>d.</i> Assess exploitation of sub-components by fisheries                              |

#### A2. Improve understanding the fish ecology

##### Develop Projects to fund the collection & assessment of fish populations & habitats across the region

- |  |
|--|
| <i>a.</i> Collect broad-scale data on fish populations across the region     |
| <i>b.</i> Assess fish distribution & trends in abundance across the region   |
| <i>c.</i> Identify common factors limiting productivity of priority species  |
| <i>d.</i> Translate Information into the regional & local management process |

#### A3. Improve management of aquatic ecosystems

##### Engage other conservation interests through management forums to maximise potential benefits of conservation

- |   |
|---|
| <i>a.</i> Attend & support conservation management forums & initiatives |
|---|

### B. Improve Management of the fishery resource

#### B1. Improve fisheries administration

##### Produce a Strategic Fisheries Management Plan for Argyll

- |  |
|--|
| <i>a.</i> Develop an all-species regional fisheries management body for Argyll         |
| <i>b.</i> Identify pathways of communication between national, regional & local groups |
| <i>c.</i> Support the development of a full network of local management groups         |
| <i>d.</i> Communicate with non-fishery management groups                               |

#### B2. Control exploitation of fish resources

##### Develop a regional strategy for controlling exploitation of resources

- |  |
|--|
| <i>a.</i> Use Awe fish counter to distribute real-time information of fish abundance       |
| <i>b.</i> Develop estimates of conservation limits/spawning targets for priority fisheries |
| <i>c.</i> Provide guidelines for exploitation to local management groups                   |

#### B3. Develop & support regional improvement initiatives

##### Develop a regional plan to create a series of demonstration & education projects

- |   |
|---|
| <i>a.</i> Establish a series of habitat improvement projects to demonstrate best-practice |
| <i>b.</i> Develop & deliver catch & release training workshop across the region           |
| <i>c.</i> Develop & deliver redd survey training workshop across the region               |
| <i>d.</i> Develop & deliver seminars on management techniques across the region           |

**C. Improve management of land and water resources.**

**C1. Minimise potential impacts of aquaculture related issues**

<b>Develop Area management Agreement process with Aquaculture interests</b>
<i>a.</i> Secure resources to develop fisheries & aquaculture management via TWG
<i>b.</i> Improve health status of farmed and wild fish through AMA initiatives
<i>c.</i> Monitor priority fish populations in the vicinity of aquaculture developments
<i>d.</i> Maximise benefits of restoration via the development of river management plans

**C2. Improve management of water resources**

<b>Develop regional plan to engage water resource users &amp; minimise impacts</b>
<i>a.</i> Prevent inappropriate & unsustainable developments via consultation processes
<i>b.</i> Collate information & create a database of all details of significant water usage
<i>c.</i> Inform & consult with Water Framework Directive Area Advisory Groups
<i>d.</i> Progress improvements with major hydroelectric producers through the Hydro working group

**C3. Improve management of land resources**

<b>Develop regional plan to engage land resource users &amp; minimise impacts</b>
<i>a.</i> Prevent inappropriate & unsustainable developments via consultation processes
<i>b.</i> Collate information & create a database of all details of significant land usage
<i>c.</i> Inform & consult with Water Framework Directive Area Advisory Groups
<i>d.</i> Progress improvements with major land user groups through the Argyll Land Use Forum

**D. Engage with wider management considerations**

**D1. Prevent decline in productivity**

<b>Develop regional plan establishing bio-security management</b>
<i>a.</i> Work with centres of expertise to set parameters for the plan
<i>b.</i> Create a cross-sector approach to managing bio-security
<i>c.</i> Secure funding to manage & remove threats to bio-security

**D2. Create and maintain public awareness of fishery issues**

<b>Develop communications plan to identify pathways to inform other interests of fishery issues</b>
<i>a.</i> Create multi-media display to communicate issues to the general public
<i>b.</i> Undertake public relations through the media via press releases
<i>c.</i> Expand the regional schools education programme 'Rivers In The Classroom'

**D3. Improve the quality of fisheries data**

<b>Develop improvements to protocols with other regional management groups &amp; centres of expertise</b>
<i>a.</i> Identify knowledge gaps in sampling programmes
<i>b.</i> Improve existing monitoring techniques & protocols
<i>c.</i> Where necessary, develop new techniques & protocols
<i>d.</i> Verify data quality with other regional management groups

**E. Support and develop fisheries management at the local scale**

**E1. Create River Management & Fisheries Restoration Plans**

<b>Create River Management &amp; Fisheries Restoration Plans</b>
<i>a.</i> Collate information on the fishery resource at a catchment scale
<i>b.</i> Identify limiting factors & prioritise effective mitigation initiatives
<i>c.</i> Establish catchment specific fine-scale monitoring & research programmes
<i>d.</i> Identify avenues of funding to support activities

**E2. Improve local management of fishery resource**

<b>Maintain and improve the accessibility &amp; quality of fish habitats</b>
<i>a.</i> Collate & assess data on habitat accessibility & quality
<i>b.</i> Develop a catchment-specific habitat management strategy for priority fisheries
<i>c.</i> Initiate improvements of all factors affecting productivity
<i>d.</i> Engage other management initiatives & resource users in improvement plans

## 9.5. Assessment of solutions

The solutions prescribed need to be assessed on an on-going basis through management groups made up of regional and local management groups, such as the Argyll Fisheries Trust, Argyll District Salmon fishery Board and River, Loch Improvement Associations & other resource users. Informing the affect of the management activities at a regional and local level will require a range of monitoring and investigatory techniques.

### 9.5.1. Assessment & Monitoring

A **broad-scale** assessment and monitoring of priority species is required to monitor general trends in abundance and provide insight into the common factors limiting productivity. Further to this, **fine-scale** assessment & monitoring is required to inform management of fisheries that are threatened, have significant factors limiting productivity or have undertaken improvement initiatives.

Both baseline surveys and regular follow-up monitoring of fish populations is essential in the priority catchments where fisheries are active. A sub-set of lower priority fish populations will be required to monitor the wider response of fish populations to regional management initiatives, such as Area Management Agreements.

**1. Adult fish abundance & fishery performance** – The general trends in abundance of priority species such as Atlantic salmon, brown (& sea) trout across the region may be monitored through the assessment of fishery catch data at a district level. Accurate fish counter data may also be used to assess adult returns of migratory species.

<b>Adult fish abundance &amp; fishery performance</b>
<b>a.</b> Collect & assess information on fishing effort & catches of priority species
<b>b.</b> Collate & assess count data from Scottish & Southern Energy Plc
<b>c.</b> Follow-up genetic surveys may be used to identify changes in effective population size & exploitation rates of priority species
<b>d.</b> Collate & assess snorkel survey count data

**2. Recruitment of juvenile fish** – The distribution of fish populations across the region may be informed by broad-scale sampling of all available habitats. The regional trends in recruitment success of priority species may be monitored through juvenile fish surveys at key locations. The data collected can better evaluate the productivity of freshwater fish and habitats over time.

<b>Recruitment of juvenile fish</b>
<b>a.</b> Collect repeat electrofishing survey data & assess trends against baseline data
<b>b.</b> Collect repeat redd survey data & assess trends against baseline data
<b>c.</b> Assess distribution of fry data against redd distribution
<b>d.</b> Assess distribution of fry against stocking initiatives

**3. Assess the productivity of freshwater habitats** - Information on the status of freshwater habitats and the initiatives undertaken to improve habitats will be required to assess benefits.

<b>Productivity of freshwater habitats</b>
<b>a.</b> Collect repeat habitat survey data at improvement sites & assess changes against baseline data
<b>b.</b> Collect repeat fish survey data at improvement sites & assess changes against baseline data
<b>c.</b> Collect repeat fish & habitat survey data away from improvement sites & assess controls against improvement sites
<b>d.</b> Assess & disseminate information to interest groups

**4. Assess the productivity of marine habitats** - Information on the general sea survival of migratory species is required at international, national and regional levels to assess the year-to-year fluctuations and general trends in the productivity of marine habitats.

<b>Productivity of local marine habitats</b>
<b>a.</b> Collect repeat post-smolt sea trout survey data at established sites & assess changes against baseline data
<b>b.</b> Collect repeat fish farm lice data at aquaculture sites & assess changes against baseline data
<b>c.</b> Collect repeat post-smolt survey data away from aquaculture sites & assess controls against established sites
<b>d.</b> Assess & disseminate information to interest groups

### 9.6. Cost-benefit analysis of solutions

The potential benefits and associated costs of the proposed solutions are described for the regional and local levels;

#### *Summary of cost benefit of single action solutions (yrs 1-5)*

No.	Solution	Cost (£)	Benefit
A1	Genetic & life-history investigations	138,600	Understand factors underpinning productivity of fisheries
A2	Fish ecology investigations	64,260	Have a region-wide understanding of the status of the resource
B1	Improve Fisheries administration	9,360	Improve fisheries management administration & effectiveness
B2	Control exploitation of fish resources	15,840	Maximise spawning escapement & improve productivity
D1	Prevent decline in productivity	6,840	Have a functioning bio-security policy
E1	Create River Management & Fisheries Restoration Plans	68,040	Have a framework for delivering improvement in fishery performance at a catchment scale
E2	Maintain and improve the accessibility & quality of fish habitats	68,040	Improve productivity of fisheries
	<b>Total</b>	<b>370,980</b>	

#### *Summary of cost-benefit of multiple on-going solutions (annual)*

No.	Solution	Cost (£)	Benefits
A3	Management of aquatic ecosystems	6,480	Have a holistic framework for management of the resource
B3	Develop & support regional improvement initiatives	30,400	Have raised awareness & participation of best-practice management across the region
C1	Minimise potential impacts of aquaculture related issues	30,240	Have sustainable wild fisheries & aquaculture industries
C2	Improve management of water resources	7,560	Have sustainable use of water resources
C3	Improve management of land resources	7,560	Have sustainable use of land resources
D2	Create and maintain public awareness of fishery issues	24,960	Have improved awareness & contribution of the general public to management of the resource
D3	Improve the quality of fisheries data	3,600	Have high quality information upon which to inform the management process
	<b>Total</b>	<b>110,800</b>	

**A. Identify the factors underpinning productivity of fisheries**

**A1. Identify, maintain & manage fish population structures** - Develop work Programme to assess fish population structuring across the region

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Collect genetic & Life-history information	Electrofishing survey sampling	27	720	19,440	Sampling undertaken as part of regional & local monitoring programme
	Fishery sampling	27	720	19,440	
Genetic analysis	Laboratory analysis	3,000	30	90,000	Samples available for comparison
Life-history analysis	Length/age frequency analysis	27	180	4,860	Provide database of life-history variation
Reporting & Interpretation	Assigning potential structuring & life history variation	27	180	4,860	Inform fundamentals of management policy at regional and local levels.
<b>Totals</b>				<b>138,600</b>	

**Notes;** Single action solution undertaken in first 5 years

**A2. Improve understanding the fish ecology** - Develop work Programme to assess fish populations & habitats across the region

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Collect broad-scale data on fish populations	Electrofishing surveys	27	720	19,440	Improved understanding of broad-scale fish distribution & relative abundance
	Habitat surveys	27	720	19,440	
Assess fish distribution & trends in abundance	Analysis	27	360	9,720	Have available data reports to communicate findings
	Reporting	27	360	9,720	
Identify common factors limiting productivity	Regional analysis of survey data	3	360	1,080	Improved understanding of priority issues to be tackled at the regional management scale
Translate Information into the regional & local management process	Transpose information to catchment plans Identify regional priorities	27	180	4,860	Raised awareness of issues in management groups
<b>Totals</b>				<b>64,260</b>	

**Notes;** Single action solution undertaken in first 5 years

Argyll Fisheries Trust, Part 9 – Potential Management Actions

**A3. Improve management of aquatic ecosystems** – Engage with other conservation interests to maximise potential benefits;

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Engage & support Local Biodiversity Action Group	Develop common initiatives to improve biodiversity	6	360	2,160	Improved cross-sector approach to wildlife & biodiversity management
Engage with species specific management groups	Contribute to European beaver, Seal & bird management groups	3	360	1,080	Improved cross-sector approach to single species management
Where appropriate, develop multi-fish species approach	Analysis of fish & habitat surveys	6	360	2,160	Improve understanding of interaction between species
Develop & disseminate information on ecosystem management	Desk-based production of ecosystem information	3	360	1,080	Increased awareness of management issues across sectors & within fisheries
<b>Totals</b>				<b>6,480</b>	

**Notes;** Multiple action solution undertaken annually

**B. Improve Management of the fishery resource**

**B1. Improve fisheries administration** – Produce a Strategic Fisheries Management Plan for Argyll

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Develop regional fisheries management structure	Demonstrate common benefits through proposals & seminar	3	360	1,080	Establish a professional & cost effective management body
Identify key information & pathways for distribution	Produce proposals & establish information pathways	3	360	1,080	Improved communications of significant issues will improve management
Establish a full network of local management groups	Continue to support local management groups	10	360	3,600	Region-wide coverage will improve management & avoid inappropriate activities
Produce a Strategic Fishery Management Plan for the region	Desk-based production of regional management strategy	10	360	3,600	Strategic approach will maximise benefits of available resources & establish a cross-sector approach to management
<b>Totals</b>				<b>9,360</b>	

**Notes; Notes;** Single action solution undertaken in first 5 years

Argyll Fisheries Trust, Part 9 – Potential Management Actions

**B2. Control exploitation of fish resources** – Develop a regional strategy for controlling exploitation of resources

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Set-up Awe fish counter to distribute real-time information of fish abundance	Collate & disseminate information of S&SE Awe fish counts	5	360	1,800	Have early-warning of weak year classes & avoid over-exploitation
Develop estimates of conservation limits/spawning targets for priority fisheries	Produce estimations of abundance, exploitation & egg deposition	29	360	10,440	Have estimates of sustainable catch
Provide guidelines for exploitation to local management groups	Utilise fishery & survey data to produce guidelines for local management groups	10	360	3,600	Raised awareness of local management groups of controlling exploitation
<b>Totals</b>				<b>15,840</b>	

**Notes:** Single action solution undertaken in first 5 years

**B3. Develop & support regional improvement initiatives** - Develop a regional plan to create a series of demonstration & education projects

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Establish a series of habitat improvement projects to demonstrate best-practice	Project development Create habitat demonstration project	5	5,000	25,000	Fill knowledge gaps on habitat restoration techniques
Develop & deliver catch & release training workshops	Projects development Deliver catch & release workshops	3	720	2,160	Have improved effectiveness of catch & release technique & associated benefits
Develop & deliver redd survey training workshop	Projects development Deliver redd survey workshops	3	720	2,160	Have improved data collection & raised awareness of habitat requirements
Develop & deliver seminars on management techniques	Projects development Deliver seminars	3	360	1,080	Have improved management at a local scale
<b>Totals</b>				<b>30,400</b>	

**Notes;** Multiple action solution undertaken annually

Argyll Fisheries Trust, Part 9 – Potential Management Actions

**C. Improve management of land and water resources.**

**C1. Minimise potential impacts of aquaculture related issues - Develop Area Management Agreement process;**

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Develop fisheries & aquaculture management	Engage & work with TWG related initiatives (AMAs)	14	360	5,040	Have communications between & improved management practices of both sectors
Improve health status of farmed and wild fish	Promote strategic management of both sectors	7	360	2,520	Have improved health status of farmed & wild fish
Monitor priority fish populations	Monitoring of parasite burdens of post-smolt sea trout	21	720	15,120	Have real-time information on health of wild fish populations
Maximise benefits of restoration	Develop River Management & Fishery Restoration Plans	21	360	7,560	Have fisheries restoration plans to improve fishery performance
<b>Totals</b>				<b>30,240</b>	

**Notes;** Multiple action solution undertaken annually

**C2. Improve management of water resources - Develop regional plan to engage water resource users & minimise impacts**

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Prevent inappropriate & unsustainable developments	Engage developers & regulators through consultation process	3	360	1,080	Prevent decline in productivity
Collect information & create a database of all details of water usage	Create database of water use Analysis of survey data in affected catchments	10	360	3,600	Improve understanding of effects of developments on productivity
Inform & consult with Water Framework Directive Area Advisory Groups	Attend & support WFD AAGs to improve management of water resources	4	360	2,160	Have raised awareness of fisheries issues amongst regulators & other resource users
Progress improvements the Hydro working group	Attend & support Hydro Working Group to improve management of water resources	2	360	720	Have on-going dialogue & improved management of hydro developments
<b>Totals</b>				<b>7,560</b>	

**Notes;** Multiple action solution undertaken annually

Argyll Fisheries Trust, Part 9 – Potential Management Actions

**C3. Improve management of land resources** - Work with resource users and centres of expertise improve management;

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Prevent inappropriate & unsustainable developments	Engage developers & regulators through consultation process	3	360	1,080	Prevent decline in productivity
Collect information & create a database of land usage	Create database of land use Analysis of survey data in priority catchments	10	360	3,600	Improve understanding of effects of developments on productivity
Inform & consult with Water Framework Directive Area Advisory Groups	Attend & support WFD AAGs to improve management of land resources	4	360	2,160	Have raised awareness of fisheries issues amongst regulators & other resource users
Progress improvements through the Argyll Land Use Forum	Attend & support Argyll Land Use Forum to improve management of land resources	2	360	720	Have on-going dialogue & improved management of land usage
<b>Totals</b>				<b>7,560</b>	

**Notes;** Multiple action solution undertaken annually

**D. Engage with wider management considerations**

**D1. Prevent decline in productivity** – Develop regional plan establishing Argyll Bio-security Management Plan

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Develop Bio-Security Management Plan for Argyll	Desk-based collation of information & strategic planning	10	360	3,600	Prevent decline in productivity
Work with centres of expertise to set parameters for the plan	Identify requirements of plan through consultation	3	360	1,080	Have input from centres of expertise
Create a cross-sector approach to managing bio-security	Activate a Bio-security Working Group to steer process	3	360	1,080	Have broad-scale input to plan development
Secure funding to manage & remove threats to bio-security	Use plan to identify & undertake management activities	3	360	1,080	Have resources to undertake mitigation
<b>Totals</b>				<b>6,840</b>	

**Notes;** Single action solution undertaken in first 5 years

Argyll Fisheries Trust, Part 9 – Potential Management Actions

**D2. Create and maintain public awareness of fishery issues** - Develop communications plan to identify pathways to inform other interests of fishery issues

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Communicate fisheries issues to the general public	Develop multi-media display	1	1,000	1,000	Have high quality communications
	Maintain web site	2	360	720	Provide up-to-date information on resource
	Attend & support public events	4	360	1,440	Raised local profile of fisheries issues
Undertake public relations through the media	Develop PR policy	1	360	360	Have structure for communications
	Create press releases	2	360	720	Raised local profile of fisheries issues
	Create relevant magazine articles	2	360	720	Raised local profile of fisheries issues amongst resource users
Expand the regional schools education programme	Expand & deliver 'Rivers In The Classroom' project across Argyll	20	1,000	20,000	Improved awareness of younger generation of biodiversity & fishery issues
<b>Totals</b>				<b>24,960</b>	

**Notes;** Multiple action solution undertaken annually

**D3. Improve the quality of fisheries data** – Develop improvements to techniques & protocols with centres of expertise

Solutions	Activity	No. Units	Unit cost (£)	Total cost (£)	Benefits
Identify knowledge gaps	Review & assess sampling programmes	2	360	720	Have a holistic sampling programme
Improve existing monitoring techniques & protocols	Engage centres of expertise to improve existing techniques	3	360	1,080	Have cost effective sampling programme
Where necessary, develop new techniques & protocols	Engage centres of expertise to develop new techniques	3	360	1,080	Have a holistic sampling programme
Verify data quality	Consult centres of expertise to verify data quality	2	360	720	Have an accurate assessment of fish resources
<b>Totals</b>				<b>3,600</b>	

**Notes;** Multiple action solution undertaken annually

**E. Support and develop fisheries management at the local scale****E1. Create River Management & Fisheries Restoration Plans**

<b>Solutions</b>	<b>Activity</b>	<b>No. Units</b>	<b>Unit cost (£)</b>	<b>Total cost (£)</b>	<b>Benefits</b>
Collate information on the fishery resource at a catchment scale	Collect catchment-scale information into a technical summary to support plans	27	1,800	29,160	Have high definition information of resources in priority catchments
Identify limiting factors & prioritise effective mitigation initiatives	Analyse fishery data & report findings	27	720	19,440	Have adequate assessment of catchment scale factors affecting productivity
Establish catchment specific fine-scale monitoring & research programmes	Develop fine-scale survey programme	27	360	9,720	Have on-going supply of information to support management plans
Identify avenues of funding to support activities	Use plan to engage project partners to fund initiatives	27	360	9,720	Have resources to carry-out activities
<b>Totals</b>				<b>68,040</b>	

**Notes;** Single action solution undertaken in first 5 years

**E2. Maintain and improve the accessibility & quality of fish habitats**

<b>Solutions</b>	<b>Activity</b>	<b>No. Units</b>	<b>Unit cost (£)</b>	<b>Total cost (£)</b>	<b>Benefits</b>
Collate & assess data on habitat accessibility & quality	Desk-based collation of habitat information	27	720	19,440	Have high definition information of resources in priority catchments
Develop a catchment-specific habitat management strategy	Develop habitat management strategy tailored to local needs	27	720	19,440	Have adequate assessment of catchment scale factors affecting productivity
Initiate improvements of all factors affecting productivity	Develop plans to tackle priority issues affecting productivity	27	720	19,440	Have framework to implement improvements
Engage other management initiatives & resource users in improvement plans	Secure cross-sector support for initiatives & attract funding partners	27	360	9,720	Have resources to carry-out activities
<b>Totals</b>				<b>68,040</b>	

**Notes;** Single action solution undertaken in first 5 years

## 9.7. Sources of Funding

The resources required to fund the identified management actions are not currently generated within the fisheries sector due to poor fishery performance and consequent depression in income and resources available for investment. Securing income into the fisheries sector will require the development of a series of projects that will attract outside investment and secure in-kind support from the fisheries sector.

### A. Identify the factors underpinning productivity of fisheries

#### A1. Identify, maintain & manage fish population structures

Activity	Lead	Support	Likely funding sources
Electrofishing survey sampling Fishery sampling	AFT	DSFBs L&RIAs	Fisheries & other resource users (Project based - baseline surveys of all catchments) Direct funding from fisheries interests
Laboratory analysis	FRS		SALSEA Programme
Length/age frequency analysis	AFT	FRS	Fisheries & other resource users (Project based - baseline surveys of all catchments)
Assigning potential structuring & life history variation	AFT	FRS	SALSEA Programme

#### A2. Improve understanding the fish ecology - Develop work Programme to assess fish populations & habitats across the region

Activity	Lead	Support	Likely funding sources
Electrofishing surveys Habitat surveys	AFT	DSFBs L&RIAs	Fisheries & other resource users (Project based - baseline surveys of all catchments)
Analysis & reporting	AFT	FRS	Fisheries & other resource users (Project based - baseline surveys of all catchments)
Regional & national analysis of survey data	AFT	RAFTS, FRS	RAFTS, ADSFB, FRS
Transpose information to catchment plans Identify regional priorities	AFT	DSFBs L&RIAs	Fisheries & TWG (as part of restoration initiative of AMA process)

#### A3. Improve management of aquatic ecosystems – Engage with other conservation interests to maximise potential benefits;

Activity	Lead	Support	Likely funding sources
Develop common initiatives to improve biodiversity	LBAP	AFT	SNH, LBAP, FWAG, SRDP
Contribute to European beaver, Seal & bird management groups	SNH	AFT	SNH, LBAP, FWAG, SRDP
Analysis of fish & habitat surveys	AFT	FRS	(Undertaken as part of monitoring programme)
Desk-based production of ecosystem information	AFT	SNH	SNH, LBAP, FWAG, SRDP

**B. Improve Management of the fishery resource****B1. Improve fisheries administration** – Produce a Strategic Fisheries Management Plan for Argyll

Activity	Lead	Support	Likely funding sources
Demonstrate common benefits through proposals & seminar	DSFBs	AFT	Scottish Government, Assoc. DSFBs, RAFTS
Produce proposals & establish information pathways	DSFBs	AFT	Scottish Government, Assoc. DSFBs, RAFTS
Continue to support local management groups	DSFBs	AFT	Scottish Government, Assoc. DSFBs, RAFTS
Desk-based production of regional management strategy	AFT	DSFBs	Scottish Government, Assoc. DSFBs, RAFTS

**B2. Control exploitation of fish resources** – Develop a regional strategy for controlling exploitation of resources

Activity	Lead	Support	Likely funding sources
Collate & disseminate information of Awe fish counts	AFT	DSFB S&SE	RAFTS; Project based support as part of a national initiative to utilise all fish counters as part of an early warning system
Produce estimations of abundance, exploitation & egg deposition	AFT	FRS	RAFTS; Nation-wide project
Utilise fishery & survey data to produce guidelines for local management groups	AFT	DSFBs	DSFBs

**B3. Develop & support regional improvement initiatives** - Develop a regional plan to create a series of demonstration & education projects

Activity	Lead	Support	Likely funding sources
Project development Create habitat demonstration project	AFT AFT	SEPA RRC	SEPA, SNH, FWAG, LBAP, SRDP
Projects development Deliver catch & release workshops	AFT AFT	DSFBs AST	AST, SNH
Projects development Deliver redd survey workshops	AFT AFT	DSFBs AST	AST, SNH
Projects development Deliver series of seminars	AFT	DSFBs	AST, SNH

**C. Improve management of land and water resources.****C1. Minimise potential impacts of aquaculture related issues - Develop Area Management Agreement process;**

<b>Activity</b>	<b>Lead</b>	<b>Support</b>	<b>Likely funding sources</b>
Engage & work with TWG related initiatives (AMAs)	TWG	AFT DSFBs Farms	TWG
Promote strategic management of both sectors	TWG	AFT DSFBs Farms	TWG
Monitoring of parasite burdens of post-smolt sea trout	TWG	AFT DSFBs Farms	TWG
Develop River Management & Fishery Restoration Plans	TWG	AFT DSFBs Farms	TWG

**C2. Improve management of water resources - Develop regional plan to engage water resource users & minimise impacts**

<b>Activity</b>	<b>Lead</b>	<b>Support</b>	<b>Likely funding sources</b>
Engage developers & regulators through consultation process	DSFBs	AFT	Resource developers
Create database of water use Analysis of survey data in affected catchments	SEPA AFT	FRS	WFD SEPA, Resource users
Attend & support WFD AAGs to improve management of water resources	AFT	DSFBs	WFD, SNH
Attend & support Hydro Working Group to improve management of water resources	DSFBs	AFT	Resource users

**C3. Improve management of land resources - Work with resource users and centres of expertise improve management;**

<b>Activity</b>	<b>Lead</b>	<b>Support</b>	<b>Likely funding sources</b>
Engage developers & regulators through consultation process	DSFBs	AFT	Resource developers
Create database of land use Analysis of survey data in priority catchments	SEPA AFT	FWAG FRS	WFD SRDP
Attend & support WFD AAGs to improve management of land resources	AFT	DSFBs	WFD, SNH
Attend & support Argyll Land Use Forum to improve management of land resources	DSFBs	AFT	WFD, SNH

**D1. Prevent decline in productivity** – Develop regional plan establishing Argyll Bio-security Management Plan (& Argyll Bio-security Management Group [ABMG])

Activity	Lead	Support	Likely funding sources
Desk-based collation of information & strategic planning	ABMG	AFT	LBAP, SRDP, SNH, RAFTS
Identify requirements of plan through consultation	ABMG	AFT	LBAP, SRDP, SNH, RAFTS
Activate a Bio-security Working Group to steer process	ABMG	AFT	LBAP, SRDP, SNH, RAFTS
Use plan to identify & undertake management activities	ABMG	AFT	LBAP, SRDP, SNH, RAFTS

**D2. Create and maintain public awareness of fishery issues** - Develop communications plan to identify pathways to inform other interests of fishery issues

Activity	Lead	Support	Likely funding sources
Create multi-media display	AFT	DSFBs	SNH
Maintain web site	AFT		
Attend & support public events	AFT		
Develop PR policy	AFT	RAFTS	RAFTS
Create press releases			
Create relevant magazine articles			
Expand & deliver 'Rivers In The Classroom' project across Argyll	AFT	DSFBs	SNH, LBAP, RAFTS

**D3. Improve the quality of fisheries data** – Develop improvements to techniques & protocols with centres of expertise

Activity	Lead	Support	Likely funding sources
Review & assess sampling programmes	AFT	SFCC FRS	RAFTS – nation-wide project
Engage centres of expertise to improve existing techniques	SFCC FRS	AFT	RAFTS – nation-wide project
Engage centres of expertise to develop new techniques	SFCC FRS	AFT	RAFTS – nation-wide project
Consult centres of expertise to verify data quality	SFCC FRS	AFT	RAFTS – nation-wide project

**E. Support and develop fisheries management at the local scale****E1. Create River Management & Fisheries Restoration Plans**

Activity	Lead	Support	Likely funding sources
Collect catchment-scale information into a technical summary to support plans	AFT	FRS	Fisheries & other resource users (Project based - baseline surveys of all catchments)
Analyse fishery data & report findings	AFT	FRS	Fisheries & other resource users (Project based - baseline surveys of all catchments)
Develop fine-scale survey programme	AFT	FRS	TWG
Use plan to engage project partners to fund initiatives	AFT	DSFBs	TWG

**E2. Maintain and improve the accessibility & quality of fish habitats**

<b>Activity</b>	<b>Lead</b>	<b>Support</b>	<b>Likely funding sources</b>
Desk-based collation of habitat information	AFT	FRS	LBAP, SRDP, SNH, RAFTS
Develop habitat management strategy tailored to local needs	AFT	FRS	LBAP, SRDP, SNH, RAFTS
Develop plans to tackle priority issues affecting productivity	AFT	FRS	LBAP, SRDP, SNH, RAFTS
Secure cross-sector support for initiatives & attract funding partners	AFT	RAFTS	LBAP, SRDP, SNH, RAFTS

## 9.8. Subsequent actions

Assessing the effects of the first phase of actions on fish populations through investigation and monitoring techniques will be important to inform and improve subsequent actions

### A. Identify the factors underpinning productivity of fisheries

#### A1. Identify, maintain & manage fish population structures

First phase activity	Monitoring	Subsequent actions
Electrofishing survey sampling of salmon populations.	Assess sampling distribution	Re-sample a subset of populations to assess temporal stability of population structures. Sample lower priority catchments.
Fishery sampling	Assess temporal range of sampling	Develop similar project for trout populations.
Laboratory analysis	Cross-reference with other regions	Create database of farmed fish genetics to assess interactions with wild fish
Length/age frequency analysis	Cross-check a sub-set of scale age readings	Undertake analysis of trout populations
Assigning potential structuring & life history variation	Cross-check analysis with centres of expertise	Undertake analysis of trout populations

#### A2. Improve understanding the fish ecology

First phase activity	Monitoring	Subsequent actions
Electrofishing surveys Habitat surveys	Independent review & assessment of fish & habitat survey data	Repeat fish surveys on priority catchments on a bi-annual basis. Increase coverage of baseline surveys on lower priority catchments.
Analysis & reporting	Independent review & assessment of sub-set of reports	Incorporate recommendations of review process
Regional & national analysis of survey data	Provide national guidance on standards of reporting	Incorporate national guidelines in future reporting
Transpose information to catchment plans Identify regional priorities	Assess usefulness of information produced	Update survey data information in catchment plans & review policies accordingly

#### A3. Improve management of aquatic ecosystems

First phase activity	Monitoring	Subsequent actions
Develop common initiatives to improve biodiversity	Assess progress against objectives of Local Biodiversity Action Plan	Review progress of initiatives over time. Re-assess LBAP & other conservation objectives & priorities
Contribute to European beaver, Seal & bird management groups	Assess progress of management groups	Review status of conservation & management strategy
Analysis of fish & habitat surveys	Independent review & assessment of data	Repeat surveys as necessary
Desk-based production of ecosystem information	Review by centres of expertise	Expand detail of information as necessary

**B. Improve Management of the fishery resource****B1. Improve fisheries administration** – Produce a Strategic Fisheries Management Plan for Argyll

<b>First phase activity</b>	<b>Monitoring</b>	<b>Subsequent actions</b>
Demonstrate common benefits Strategic Fisheries Management Plan	Assess requirements and views of regional & local fishery management groups	Review requirements of management groups before second phase of strategic plan
Produce proposals & establish information pathways	Assess proposals with management groups	Review proposals before second phase of plan
Continue to support local management groups	Assess adequacy of support provided	Review adequacy of support before second phase of plan
Desk-based production of regional management strategy	Produce draft for review by management groups	Review adequacy of first phase before second phase of plan

**B2. Control exploitation of fish resources** – Develop a regional strategy for controlling exploitation of resources

<b>First phase activity</b>	<b>Monitoring</b>	<b>Subsequent actions</b>
Collate & disseminate information of Awe fish counts	Assess accuracy of counts through video analysis	Produce robust information on cut-off points for fish exploitation based on strength of adult returns
Produce estimations of abundance, exploitation & egg deposition	Assess estimates with centres of expertise	Ground-truth estimates against survey data
Utilise fishery & survey data to produce guidelines for local management groups	Assess estimates with centres of expertise	Ground-truth estimates against survey data

**B3. Develop & support regional improvement initiatives** - Develop a regional plan to create a series of demonstration & education projects

<b>First phase activity</b>	<b>Monitoring</b>	<b>Subsequent actions</b>
Project development Create habitat demonstration project	Assess relative success of project	Develop second phase of demonstration projects for other habitat types
Projects development Deliver catch & release workshops	Assess feedback from user groups	Make changes to workshop according to feedback. Broaden scope of workshop
Projects development Deliver redd survey workshops	Assess feedback from user groups	Make changes to workshop according to feedback. Broaden scope of workshop
Projects development Deliver series of seminars	Assess feedback from user groups	Make changes to workshop according to feedback. Broaden scope of workshop

**C. Improve management of land and water resources.****C1. Minimise potential impacts of aquaculture related issues - Develop Area Management Agreement process;**

<b>First phase activity</b>	<b>Monitoring</b>	<b>Subsequent actions</b>
Engage & work with TWG related initiatives	Assess progress against objectives	Secure further funding as necessary
Promote strategic management	Monitor responses in wild fish populations	Adapt management of both sectors accordingly
Monitoring of parasite burdens of post-smolt sea trout	Assess & review findings alongside other regional projects	Review sampling programme according to assessment
Develop River Management & Fishery Restoration Plans	Assess plans with centres of expertise.	Review plans according to assessment & survey findings

**C2. Improve management of water resources - Develop regional plan to engage water resource users & minimise impacts**

<b>First phase activity</b>	<b>Monitoring</b>	<b>Subsequent actions</b>
Engage developers & regulators through consultation process	Assess effectiveness of outcomes of consultations	Highlight inconsistencies to regulators
Create database of water use & analyse survey data in affected catchments	Assess survey data & make recommendations for improvement where necessary	Fine-tune and repeat surveys to monitor site conditions against operational conditions and improvement initiatives
Attend & support WFD AAGs to improve management of water resources	Assess progress on fisheries issues	Change strategy according to progress and available resources
Attend & support Hydro Working Group to improve management of water resources	Assess progress on fisheries issues	Change strategy according to progress and available resources

**C3. Improve management of land resources - Work with resource users and centres of expertise improve management;**

<b>First phase activity</b>	<b>Monitoring</b>	<b>Subsequent actions</b>
Engage developers & regulators through consultation process	Assess effectiveness of outcomes of consultations	Highlight inconsistencies to regulators
Create database of land use Analysis of survey data in priority catchments	Assess survey data & make improvement where necessary	Fine-tune and repeat surveys to monitor site conditions against operational conditions and improvement initiatives
Attend & support WFD AAGs to improve management of land resources	Assess progress on fisheries issues	Change strategy according to progress and available resources
Attend & support Argyll Land Use Forum to improve management of land resources	Assess progress on fisheries issues	Change strategy according to progress and available resources

**D1. Prevent decline in productivity** – Develop regional plan establishing Argyll Bio-security Management Plan

First phase activity	Monitoring	Subsequent actions
Desk-based collation of information & strategic planning	Review draft plan with centres of expertise	Review adequacy of first phase before second phase of plan
Identify requirements of plan through consultation	Consult all likely user groups	Adjust plan accordingly
Activate a Bio-security Working Group to steer process	Assess output of working group against objectives	Adjust remit of working group accordingly
Use plan to identify & undertake management activities	Assess effectiveness of initiatives	Adjust plan strategy accordingly

**D2. Create and maintain public awareness of fishery issues** - Develop communications plan to identify pathways to inform other interests of fishery issues

First phase activity	Monitoring	Subsequent actions
Create multi-media display Maintain web site Attend & support public events	Obtain feedback from public & project partners	Evolve content with changing management priorities
Develop PR policy Create press releases Create relevant magazine articles	Obtain feedback from public & project partners	Evolve content with changing management priorities
Expand & deliver 'Rivers In The Classroom' project across Argyll	Obtain feedback from public & project partners	Evolve content with changing management priorities

**D3. Improve the quality of fisheries data** – Develop improvements to techniques & protocols with centres of expertise

First phase activity	Monitoring	Subsequent actions
Review & assess sampling programmes	Review with centres of expertise	Establish network of broad-scale & fine-scale sampling sites
Engage centres of expertise to improve existing techniques	Review field use & outputs	Implement improved techniques & re-assess outputs
Engage centres of expertise to develop new techniques	Review field use & outputs	Implement new techniques as necessary
Consult centres of expertise to verify data quality	Review with other data collectors	Address changes to protocols & sampling programmes as necessary

**E. Support and develop fisheries management at the local scale****E1. Create River Management & Fisheries Restoration Plans**

<b>First phase activity</b>	<b>Monitoring</b>	<b>Subsequent actions</b>
Collect catchment-scale information into a technical summary to support plans	Independent review & assessment of fish & habitat survey data	Update technical summary with information as acquired
Analyse fishery data & report findings	Independent review	Assess changes in fish populations over time
Develop fine-scale survey programme	Independent review	Repeat fine-scale fish surveys on priority sites & species
Use plan to engage project partners to fund initiatives	Annual review by management group	Acquire continuity of resources to support on-going activities

**E2. Maintain and improve the accessibility & quality of fish habitats**

<b>First phase activity</b>	<b>Monitoring</b>	<b>Subsequent actions</b>
Desk-based collation of habitat information	Independent review Highlight knowledge gaps	Undertake sampling as necessary to fill knowledge gaps
Develop habitat management strategy tailored to local needs	Independent review & re-draft habitat management strategy where necessary	Review strategy after feedback from responses of fish & habitats to improvement initiatives
Develop plans to tackle priority issues affecting productivity	Independent review & re-draft improvement plans as necessary	Implement plans in priority sites
Secure cross-sector support for initiatives & attract funding partners	Annual review by management group	Acquire continuity of resources to support on-going activities