

7. Proposed management actions

The following management actions are proposed within the six year period 2009-2015. A number of management actions are proposed for each issue identified. A list of organisation abbreviations is provide at the end of this section.

Issue 1	Water Quality					
	Management Action	Challenges	Partner Organisation	Expectations within six year planning cycle	Legislation or guidelines	Note
Diffuse pollution and nutrient enrichment	Promote environmentally acceptable agricultural practices, waste management plans, stock exclusion from watercourses, bankside fencing.	Funding, landowner participation	SGRPID, SEPA, NFU, FWAG, SAC, ART, Farming advisors	Reduction in effluent spills. Improvement in water quality within priority watercourses	PEPFAA code (2005) ¹ and Four Point Plan (2004) ² Diffuse Pollution General Binding Rules ³ Bathing Waters (Scotland) Regulations (1991) ⁴ .	1.1
	Promote constructed wetlands to assimilate farm steading run-off	Funding, landowner participation	SGRPID, SEPA, NFU, FWAG, SAC, ART, Farming advisors	Reduced nutrient levels. Creation of biodiversity ponds	PEPFAA code (2005) and GAEC guidelines (2005) Diffuse Pollution General Binding Rules Bathing Waters (Scotland) Regulations (1991).	1.1
	Improve slurry storage and application	Funding, landowner participation	SGRPID, SEPA, NFU, FWAG, SAC, ART, Farming advisors	Reduced nutrient levels.	“	1.1
Treated sewage effluent	Partnership working with operators and regulators to prioritise outfalls on basis of measured impact. Detailed assessment of existing discharges on downstream ecology and fish production	Conflicting assessment of impact on local ecology. Investment to upgrade facilities.	SEPA, SW, ART, DSFB's	Target investment at priority facilities. Improvements in river and bathing water quality.	PPC Regulations (2000) ⁵ Controlled Activities Regulations (2005) ⁶ (superseding COPA, 1974) Urban Waste Water Treatment (Scotland) Regulations (1994) ⁷	1.2

Combined sewage outfalls	Partnership working with operators and regulators	Lack of investment. Timing of instream works Climate change, more intense rainfall	SEPA, SW, ART	Target investment at priority facilities. Improvements in river and bathing water quality.	Controlled Activities Regulations (2005) (superseding COPA, 1974) Urban Waste Water Treatment (Scotland) Regulations (1994)	1.3
Acidification	Influence forestry practices Identify problem areas. Investigate treatment options. Stock with grown on fry	Scale of forestry, granite geology and lack of natural buffering system Intervention without harm	FC, SNH, ART, DSFB's	Accelerate long-term decline in anthropogenic acidification and boost aquatic productivity	Forest and Water Guidelines (2003) ⁸	1.3
Coal mine effluent	Complete risk analysis of existing mines, identify and implement ways of reducing the risk of pollution events. Restoration of affected tributaries.	Conflicting assessments of risk to local ecology. Climate change – increasing rainfall Funding.	SEPA, Coal Authority, DSFB's, SNH, ART	Reduction in pollution, improved mitigation measures, minimisation of habitat loss and increased productivity in restored tributaries.	CAR (2005) (superseding COPA, 1974 and Groundwater Regulations (1998) The Mines (Notification of Abandonment) (Scotland) Regulations 1998 ⁹ Contaminated Land (Scotland) Regulations (2005) ¹⁰	1.5

Notes

- 1.1 ART are already working in partnership with FWAG and SAC advisors on SRDP applications. Priority sub-catchments have been identified and funding has been applied for to allow ART to facilitate the development of collaborative projects.
- 1.2 River Ayr STW's are considered to be highest priority.
- 1.3 Kilmarnock area CSO's are due for investment (http://www.scottishwater.co.uk/portal/page/portal/SWE_PGP_INVESTMENT/SWE_PGE_INVESTMENT/WHAT_VIS_AYR). ART has met with Scottish Water regarding upgrade of CSO's in Ayrshire.
- 1.4 ART has good relations with Forestry Commission. There is however a need to highlight the issue in Ayrshire as it is generally perceived to be a Galloway problem.
- 1.5 Coal authority responsible for discharges from old deep mines. SEPA are responsible for regulating discharges from opencast mines.

Issue 2	Habitat Degradation					
	Management Action	Challenges	Partner Organisation	Expectations within six year planning cycle	Legislation or guidelines	Note

Overgrazing on banksides by farm stock	Promote environmentally acceptable agricultural practices. Encourage landowners to adopt appropriate options within SRDP such as riparian fencing.	Funding, landowner participation	SGRPID, SEPA, NFU, FWAG, SAC, ART, Farming advisors	Improvement in physical habitat in improved stretches, increased fish production, improved river and bathing water quality.	PEPFAA code (2005) and GAEC guidelines (2005) Diffuse Pollution General Binding Rules	2.1
Overshading by riparian trees	Promote best practise in riparian tree planting and management. Encourage landowners to adopt appropriate options within SRDP	Conflicting conservation aims. Landowner participation	FC, SGRPID, EAW, FWAG, SAC, Forestry advisors, ART,	Improved fish production within improved stretches,	Forest and Water Guidelines (2003)	2.2
Siltation and compaction of gravel substrate	Investigate sources of siltation	Funding, research partners	ART, SEPA	Improved understanding of sources of silt and pathways into watercourses.	Controlled Activities Regulations (2005) (superseding COPA, 1974)	2.3
	Investigate survival of salmonid ova in lower reaches of rivers subject to siltation	Funding	ART, DSFB's	Understanding of potential bottleneck in juvenile salmonid production	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 ¹¹	2.4
	Clean spawning gravels in targeted areas	Volunteer involvement	ART, DSFB's	Localised improvements in spawning gravels and spawning success	Controlled Activities Regulations (2005)	2.5
Urbanisation	Encourage soft engineering techniques for flood and erosion protection.	Developer participation and compliance Building control standards Building on flood plains	LA's, SEPA, , ART	Reduction in flow amplitude and severity of erosion. Minimise loss of fisheries habitat.	Building (Scotland) Regulations (2004) CAR (2005) ¹² EU Flood Risk Directive (2007) ¹³ PPC Regulations (2000)	2.6
	Use of SUDS drainage.	Economic pressures H&S concerns	SEPA, LA's	Improved water quality emanating from urban developments	Building (Scotland) Regulations (2004) CAR (2005)	2.7
Instream modifications	Increase diversity within previously canalised stretches	Landowner resistance Funding Conflict of interest	SEPA, ART, DSFB's	Improved habitat for fish and other wildlife (e.g. freshwater pearl mussels). Increased productivity	CAR (2005) General Binding Rules	2.8

		Flood risk				
	Replacement of instream boulders into previously modified stretches	Timing of restoration works Flood risk	SEPA, ART, DSFB's, landowners	Increased productivity particularly of parr	CAR (2005) General Binding Rules	2.9

Notes

2.1 Measures to address this issue are similar to those for reducing impact of diffuse pollution. See note 1.1 above.

2.2 ART primary role is to raise awareness regarding this issue, although coppicing or similar woodland management in targeted areas could be of great benefit to fish production and other biodiversity.

2.3 Measures to reduce diffuse pollution and improve habitat quality should lead to reduce silt input. Targeted measures to remove silt from spawning gravels by manual cleaning are known to be very successful in enhancing salmonid spawning success. Likely to be a task undertaken by bailiffs or angling groups and workshop should be held to introduce technique.

2.4 Salmon spawning success in lower reaches of Ayr and Girvan known to be variable. Abiotic factors such as siltation and gravel compaction may be responsible.

2.5 Cost effective measure that can stimulate interest in fishery management

2.6 Recent flood prevention scheme at Galston 2007/8 involved considerable hard engineering works. SEPA are monitoring the impact of these works and a report should be made available in 2009.

2.7 Discussions with LA officers suggest that there is financial pressure from developers to minimise land take for SUDS schemes. Health and Safety concerns regarding children and ponds are also a disincentive.

2.8 River restoration works tend to be very expensive. Low intervention works such as allowing bankside trees to grow will hasten the process of recovery.

2.9 Evidence of boulder removal to build dykes, roads, reinforce banks, etc can be seen everywhere. Boulder cover is vital for salmon parr in particular, ART find the best parr densities in areas of undisturbed riverbed with loose cobbles and boulders.

Issue 3						
Obstructions to fish migration/Restricted access to spawning nursery habitat						
	Management Action	Challenges	Partner Organisation	Expectations within six year planning cycle	Legislation or guidelines	Note
Kilmarnock Water, modifications to Black Rocks Waterfall and Dean Castle ford	Improve fish passage over both obstructions	Funding, Public perception, Flood risk assessment	ART, EAC, SEPA, RIAIA	Currently impassable, migratory fish will have access to 28km of good quality nursery habitat. Substantial production of migratory fish smolts	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 Planning regulations	3.1

Lugton Water, Garden Weir and Sevenacres Weir	Provide fish passes or removal of weirs	Funding, landowner participation, Flood risk assessment	ART, NAC, SEPA, Landowners, Angling Clubs	Effectively impassable, migratory fish will have access to 23km of good quality nursery habitat.	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 Planning regulations	3.2
Gogo Water, Weirs at Halkhill	Improve fish passage over deteriorating weirs	Funding, landowner participation	Landowner, ART, SEPA	Reinstate access to the upper Gogo Water. Local population under threat of extinction	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 Planning regulations	3.3
Garnock Water, Kilwinning Weirs, including Bridgend Cauld	Weirs do not comply with Fisheries legislation. Removal of weirs or provision of properly designed fish passes	Funding, Landowner participation, Stakeholder participation, Flood Risk	ART, SEPA, Angling clubs	Improvement in free passage of migratory fish. Protection of all components of salmon stock	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 Planning regulations	3.4
River Girvan, Girvan Weirs	Weirs do not comply with Fisheries legislation Improve fish passage over both obstructions	Funding, landowner participation, Flood risk assessment	ART, Landowner, SEPA, Angling Clubs	Improvement in free passage of migratory fish. Protection of all components of salmon stock	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 Planning regulations	3.5
River Irvine Weirs, including Drybridge, Laigh Milton, Kilmarnock, Newmilns, and Darvel Weirs	These weirs are difficult obstructions for migratory salmonids and eels. Improved fish passage is required for all weirs	Funding, Landowner participation, Stakeholder participation, Flood Risk Heritage issues	ART, SEPA, RIAIA, Angling Clubs, EAC	Improvement in free passage of migratory fish including eels	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 Planning regulations	3.6
River Ayr, Catrine Weir	Improve Catrine Weir fish pass design, install fish pass at Anderson's Hole	Heritage issues Funding, Landowner participation, Stakeholder participation, Flood Risk	ART, SEPA, CCT, Ayr DSFB, EAC, Angling Club,	Improvement in free passage of migratory fish including eels. Reduction in physical damage to migratory fish. Reduction in poaching pressure	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 Planning regulations	3.7
River Ayr, Sorn Weir	Install effective fish pass	Heritage issues Funding, Landowner participation	ART, Landowner, SEPA	Removal of migration bottleneck and poaching hotspot	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	3.8

Ponesk Burn, River Ayr, channel modifications and impassable culvert	Currently impassable to migratory salmonids. Proposed re-diversion of the lower Ponesk Burn provides an opportunity to remove obstructions	Design and engineering	ART, SEPA, Scottish Coal Ayr DSFB	Open up access to 3.4km, 13,600m ² of high quality upland burn habitat	CAR (2005) (superseding COPA, 1974 and Groundwater Regulations (1998) Mines (Notification of Abandonment) Regulations (1998) Contaminated Land (Scotland) Regulations (2005)	3.9
Water of Coyle, Ness Waterfall, Sundrum	Remove concrete dam at the top of the waterfall	Landowner participation	ART, Landowner, SEPA, DSFB	Improve migratory fish passage potential at a natural waterfall.	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	3.10
Glaisnock Water, A76 culvert	Install baffles to facilitate fish passage through 55m long culvert	Funding	ART, DSFB, AMEY	Improve migratory fish access into upper Glaisnock Water	CAR (2005) General Binding Rules Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	3.11
Loch Doon dam	Assess effectiveness of fish pass for upstream and downstream migrating adult salmonids and downstream migrating smolts	Monitoring techniques, low fish numbers	ART, DSFB, SP	Better understanding of the impact of the dam on salmonid fish migration	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 The Salmon (Fish passes and Screens (Scotland) Regulations 1994) ¹⁴	3.12

Notes

- 3.1 Consultants report complete. Likely to be a two stage project with improvements to Black Rocks Waterfall undertaken first. ART has commissioned a consultants report and funding has been applied for. Funding from SCORE approved (£25,000). This is considered to be the most important management action within the Irvine catchment.
- 3.2 Two weirs are limiting access for migratory fish into the Lugton Water. This water suffers from agricultural diffuse pollution but is capable of supporting a salmonid population. Should be considered a high priority action.
- 3.3 Gogo native salmonid population considered to be under threat of extinction due to presence of two degraded weirs. Works to create a rock ramp at the lower weir underway although weather conditions in 2008 has caused delays. Considered urgent priority.
- 3.4 Two weirs in Kilwinning were identified as significant obstructions to fish migration in 2005 Garnock Habitat survey. Bridgend Cauld sluice is currently open and weir is passable at all flows. Local vested interests are attempting to have sluice boards replaced breaching salmon legislation.
- 3.5 Identified by Calderwood in 1909 as a “material obstruction” to the migration of migratory fish as neither has a fish pass. Consultants report organised by ART and funding applied for. Hope to make progress in 2009.
- 3.6 The River Irvine was heavily industrialised with many weirs built for water power. In many cases although the mills have long since crumbled the weirs remain. All are passable although they form major barriers, particularly for brown trout.

- 3.7 Catrine Weirs were once known as the worst poaching hotspot in Scotland and although much reduced, the area still requires considerable attention from the River Ayr Bailiffs. Dead salmon are found at the site every year, often early running salmon, due to damage sustained running the weirs. The current regeneration plans for the village include restoration proposals for the weir and the provision of two rock ramp fish passes and it is hoped that this will lead to easier passage for migratory fish of all species.
- 3.8 Current bottom baffle fish pass incomplete, poorly designed and totally ineffective. Complete redesign required or installation of a rock ramp. Site ideal for rock ramp fish pass. Action expected in 2009.
- 3.9 Ponesk Burn is a small catchment at the top of the River Ayr. It is a high quality upland burn currently inaccessible to salmon due to modifications created when burn was diverted. Scottish Coal want to re-divert the burn back to close to original course. This is a positive development which should result in improved fish passage. Works expected to take place in 2009.
- 3.10 Water of Coyle catchment represents 14% of the total Ayr catchment. Salmon are currently unable to jump the waterfall. Removal of concrete dam may improve fish passage potential. Large area of habitat available upstream of the waterfall. Could be of significant benefit to lower Ayr fishery.
- 3.11 Glaisnock Water culvert is a significant obstruction to migratory fish. Installation of baffles is a low cost and simple technique to improve fish passage. Diffuse pollution project will also be implemented on the Glaisnock Water.
- 3.12 Scottish Power are supportive of research proposals to investigate fish passage issues at the dam.

Issue 4	Upland landuse					
	Management Action	Challenges	Partner Organisation	Expectations within six year planning cycle	Legislation or guidelines	Note
Commercial conifer forestry	Encourage compliance with Forest and Water Guidelines. Increase percentage open space and deciduous planting during forest restructuring	Scale of forestry Forest restructuring timescales. Legacy of altered soils and drainage	FC, and independent forestry companies, SNH, ART	Improve watercourse and buffer-zone management	Forest and Water Guidelines (2003)	4.1
Hill livestock grazing	Promote restoration and conservation of upland vegetation cover.	Farming economics and modern management practices	SGRPID, SNH, SAC, FWAG, NFU	Increased retention of rainfall, increased stream baseflow and reduction in spate amplitude. More stable riparian habitat and reduction in erosion	GAEC Guidelines (2005)	4.2

Electricity generation from windpower	Ensure that site selection is appropriate. Ensure that freshwater ecology interests are fully considered at planning stage.	Renewable energy targets.	ART, DSFB's, SNH, Windpower developers, LA's	Protection or enhancement of upland riparian habitat	Planning policy Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	4.3
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- 4.1 Ongoing forest restructuring is leading to the creation of much better riparian habitat with more mixed forest age. Primarily a role for the forestry authorities, with the FC forest plans providing an excellent example.
- 4.2 Changing farming economics may lead to a reduction in upland grazing levels and a natural recovery in vegetation cover. Hills above Largs area good example with excellent heather and rough grass vegetation.
- 4.3 Many proposed windfarm sites are in afforested upland sites where the risk of environmental damage is reduced in comparison with more pristine moorland sites. ART are consulted at any early stage on many applications but not all. Need to raise awareness of freshwater ecology issues with developers.

Issue 5		Water management				
	Management Action	Challenges	Partner Organisation	Expectations within six year planning cycle	Legislation or guidelines	Note
Water abstraction	Review existing water abstractions and compensation flows to ensure compliance with legislation.	Operator staffing resources	SEPA, SW, SP	Compensation flows are provided in line with Water Orders/CAR. Improved water management within affected streams	Controlled Activities Regulations (2005) ⁴ (superseding COPA, 1974)	5.1
River flow regulation	Ensure that fisheries interests and that of river ecology are balanced	Stakeholder expectations, meeting demands for water, electricity and leisure interests whilst maintaining river ecology	SP, SEPA, Doon DSFB, ART	Balancing of river flows for protection of fishery and river ecology.	Controlled Activities Regulations (2005) ⁴ (superseding COPA, 1974)	5.2

Electricity generation from hydropower	Ensure that site selection is appropriate. Ensure that applicants are fully aware of environmental concerns and that river ecology is protected	Renewable energy targets. Conflicting interests between stakeholder interests.	ART, DSFB's, SNH, Hydropower developers	Protection or enhancement of river ecology	Planning policy	5.3
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- 5.1 Garnock Water abstraction is the main concern. SW is understood to be reviewing all abstractions to ensure compliance with WFD, providing an opportunity to highlight problem abstractions.
- 5.2 Proposal by Scottish Power to review the current compensation flow down the River Doon will require wide consultation. Scottish Power have proposed a review of compensation flows across the Galloway Hydro Scheme in order to comply with the Water Framework Directive. It is anticipated that SEPA will carry out a consultation regarding the proposal. The Doon has consistently returned the highest salmon catch of all the Ayrshire rivers and the proposal may have a significant impact on the fishery.
- 5.3 Small scale hydro proposals can pose a significant threat to migratory fish populations. ART could help developers to identify sites where there are no migratory fish issues.

Issue 6	Fish stock management					
	Management Action	Challenges	Partner Organisation	Expectations within six year planning cycle	Legislation or guidelines	Note
Angler exploitation	Assess level of exploitation and its implications for salmonid fish populations	Assessment techniques and opportunities Funding	ART, DSFB's, SNH, AST	Increased understanding of angler exploitation. Increased awareness amongst angling community of conservation measures.	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	6.1
	Promote catch and release in vulnerable stocks	Communication with angling groups	ART, DSFB's, angling clubs	Targeted conservation measures. Increased egg deposition in vulnerable stocks	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	6.2

Other human exploitation	Raise awareness of the implications of poaching in its many forms. Highlight impact of “putty” and penalties for its use	Support from the Criminal Justice system. Bailiff training	DSFB's, Police	Reduction in non-angling human exploitation of salmonid fish stocks	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	6.3
Catch return data	Improve accuracy of catch return data for all species	Angling proprietors/clubs perception of impact on rents/levies. Ownership of salmon angling rights	DSFB's, Proprietors, Angling Clubs, ART	Published catch data reflects actual catches accurately. Management of fish stocks improved.	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 The Conservation of Salmon (Collection of Statistics) (Scotland) Regulations 2006 ¹⁵	6.4
Hatchery operation	Improve hatchery husbandry and infrastructure	Funding Communication with all sectors of fishery management	ART, DSFB's Angling Clubs	Ayrshire hatcheries are operated according to best practise. All hatcheries under the advice of the ART biologists	Aquaculture and Fisheries (Scotland) Act 2007 ¹⁶ Salmon and Sea Trout: To Stock or Not. FRS (2003) ¹⁷ Hatchery Work in support of Salmon Fisheries: FRS (2007) ¹⁸	6.5

Notes

- 6.1 Angler exploitation is the most significant cause of mortality in adult salmon stocks in freshwater. The small run of spring fish in the Ayrshire rivers is particularly vulnerable to angler exploitation. Impact of angler exploitation on wild brown trout stocks is not known.
- 6.2 Not all rivers have a catch and release policy for sea trout. Catch and release policies for salmon vary between DSFB's. Published catch and release rates for salmon in Ayrshire rivers range from 58% to 16% (FRS, 2007).
- 6.3 Poaching is a constant threat although currently considered under control in all areas with the exception of the Irvine estuary. There is a requirement to ensure that all bailiffs had passed the Institute of Fisheries Management Bailiffs exam.
- 6.4 Under reporting of salmon/sea trout catches is an endemic problem, the extent of which varies from river to river. Accurate catch data is essential if the effectiveness of management actions are to be assessed. The problem occurs across all forms of leasing including syndicate water and club water.
- 6.5 There are a number of salmon/trout hatcheries operating in Ayrshire. Some are in sub-optimal locations and operate under difficult conditions. Husbandry standards also vary. ART aim to provide advice to all hatchery operators and have organised events with experienced hatchery operators. Hatcheries should respect the genetic diversity of salmon populations and should not mix stocks from one part of the river with another.

Issue 7	Predation					
	Management Action	Challenges	Partner Organisation	Expectations within six year planning cycle	Legislation or guidelines	Note

Impact of fish eating birds	Complete counts of fish eating birds in accordance with Scottish Government protocols	Availability of staffing resources. Public perception	ART, DSFB's, SG	Greater understanding of fish eating birds populations and potential impact on fish populations	Wildlife and Countryside Act 1981 ¹⁹	7.1
Seal predation	Establish research protocols to investigate impact of seal predation on migratory salmonids	Technical difficulties associated with obtaining data	ART, DSFB's, SG	Greater understanding of potential impacts of seals on migratory fish	Wildlife and Countryside Act 1981	7.2

Notes

- 7.1 Bird counts have been completed on the Stinchar and Doon. Better data would be obtained if counts on contiguous catchments were completed simultaneously.
- 7.2 Perceived to be an issue in the Stinchar and Girvan tidal reaches. Moray Firth Seal Management Plan is an excellent example of how conflicting conservation interests can be managed (Butler et al., 2008)

Issue 8	Introduced species					
	Management Action	Challenges	Partner Organisation	Expectations within six year planning cycle	Legislation or guidelines	Note
Non-native fish introduction	Raise awareness of the risks associated with introductions of non-native fish	Communication with all sectors potentially involved. Lack of knowledge of existing fish species in stillwaters	ART, Angling organisations, SG, SNH	Prevent further spread of non-native fish species within Ayrshire	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 Aquaculture and Fisheries (Scotland) Act 2007	8.1
Gyrodactylus salaris	Raise awareness of the risks associated with the introduction of this non-native parasite	Communication with all sectors potentially involved, which in this case includes canoeing organisations	ART, DSFB, SG, Canoe organisations	Maintain profile of risk associated with inadvertent introduction.	Aquaculture and Fisheries (Scotland) Act 2007 Scottish Government Gyrodactylus salaris contingency plan (2008) ²⁰ Home and Dry information leaflet (http://www.infoscotland.com/gsbug) ²¹	8.2
North American Signal Crayfish	Raise awareness of the risks of introducing Signal Crayfish into Ayrshire catchments	Communication with all sectors potentially involved.	ART, DSFB's, SNH, Police	Prevent introduction of Signal Crayfish into Ayrshire catchments	Wildlife and Countryside Act 1981	8.3

North American Mink	Establish catchment scale trial project to monitor and trap mink	Funding Availability of volunteer resources	ART, DSFB's, SNH, LBAP	Establish extent of mink population within Ayrshire. Develop control program across Ayrshire based on trial project	Wildlife and Countryside Act 1981 Ayrshire LBAP (2008) ²²	8.4
Invasive riparian weeds	Complete survey of all catchments in Ayrshire. Develop control and eradication strategy for invasive weeds	Funding Development of control strategies	ART, LBAP, SNH, Landowners, SEPA	Publication of detailed distribution maps. Increased awareness Effective control strategy for Giant Hogweed	Controlled Activities Regulations (2005) ⁴	8.5

Notes

- 8.1 New regulations published in 2008 control the introduction of fish, fry and ova into Scottish waters. Regulating bodies in Ayrshire are the local DSFB (in the case of salmon and sea trout) or Scottish Government (where there is no DSFB or for all other species). This legislation should help to control the spread of non-native species. Key role for ART is to raise awareness locally
- 8.2 ART will assist Ayrshire DSFB's and other angling organisations to take all reasonable steps to prevent the introduction of this parasite into Ayrshire rivers. The impacts of its introduction will be extremely serious with poisoning of entire catchments one of the management options. Of relevance here are inter-catchment transfers, a common practice for water supply and hydro generation.
- 8.3 ART is not aware of any populations of Signal crayfish in Ayrshire, although they may already be present. Once introduced their elimination will be very difficult. They are present in neighbouring catchments (Kirkcudbright Dee). There have been reports of crayfish trading in South Ayrshire presenting a high risk of establishment within Ayrshire rivers.
- 8.4 Mink are present throughout Ayrshire. They have had a major impact on biodiversity, including water voles, which are under severe threat in Ayrshire. Impact on fish populations locally not known.
- 8.5 Invasive riparian weeds are present in all catchments. ART should take the initiative in the development of control strategies. Control of specific weed species within catchments is a realistic prospect given adequate resources.

Issue 9	Research priorities					
	Management Action	Challenges	Partner Organisation	Expectations within six year planning cycle	Legislation or guidelines	Note

Salmon genetics mapping	Participate in the SALSEA salmon genetics project.	Funding Development of comprehensive sampling protocol	ART, RAFTS, DSFB's, FRS	Production of genetic map of salmon populations in Ayrshire Rivers	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003 Aquaculture and Fisheries (Scotland) Act 2007	9.1
Brown trout ecology	Study brown trout ecology in riverine habitat. Operate fish trap on brown trout spawning burn	Funding. Technical and staffing issues regarding operation of fish trap	ART, Angling clubs	Improved understanding of brown trout ecology in Ayrshire	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	9.2
Salmonid egg survival in agricultural catchments	Assess survival of salmonid eggs in natural redds and in planted egg boxes	Funding Technical issues re redd location and monitoring	ART, DSFB's	Understanding of potential bottleneck in salmonid production	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	9.3
Impact of sewage treatment works discharge on Lugar Water	Develop survey design to test the hypothesis that the licenced discharge from Underwood STW's is having a detrimental impact on the ecology of the Lugar Water	Funding Development of a robust experimental design acceptable to STW operator and regulator	ART, SEPA, DSFB, SW	Production of a definitive study on the impact of the works.	Controlled Activities Regulations SW Investment programme	9.4
Electrofishing and invertebrate surveys	Maintain current level of surveying and expand into all catchments	Funding ART staff resources	ART, DSFB's, SEPA, SNH	Development of comprehensive monitoring programme for all Ayrshire rivers	Water Framework Directive ²³	9.5
Firth of Clyde Sea Trout	Develop Firth of Clyde sea trout research and restoration project	Project design Funding	ART, AFT, LLFT, CRF, DSFB's, Angling organisations	Increased understanding of local sea trout ecology and management implications	Salmon and Freshwater Fisheries (Consolidation)(Scotland)Act 2003	9.6

Investigate fish populations in stillwaters	Develop fish sampling strategies for stillwaters in Ayrshire	Funding	ART, SNH	Database of stillwater fish populations Greater understanding of fish populations in Ayrshire		9.7
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- 9.1 Sampling programme already underway. SALSEA project should compliment the genetic sampling work undertaken by ART for previous genetic studies. The SALSEA project aims to map salmon genetics at a tributary scale.
- 9.2 ART have never published any reports on brown trout ecology. This is considered to be a major omission considering the importance of trout fishing in Ayrshire rivers.
- 9.3 Salmon egg survival in lowland rivers/burns subject to siltation (e.g. lower River Ayr/Girvan and tributaries), is considered to be a limiting factor. An assessment of salmon egg survival in these situations is considered to be a priority.
- 9.4 ART consistently record low oxygen levels in the Lugar Water downstream of Auchinleck. Juvenile salmonid populations are also depressed. The hypothesis is that the discharge from Underwood STW's is responsible but this needs to be tested. Oxygen monitoring by SEPA in 2008 was inconclusive mainly due to high water levels. This needs to be repeated in future years as the problem is only critical during extended periods of low water.
- 9.5 ART have developed a comprehensive network of electrofishing sites across Ayrshire but there are gaps, e.g. coastal burns and the Garnock/Irvine catchments. There is also a requirement to develop a network of statistically robust electrofishing sites to monitor trends in local salmonid fish populations.
- 9.6 Sea trout populations in Ayrshire have declined dramatically in recent decades. The reasons are not known although the universal decline of sea trout catches in all Ayrshire rivers suggest that marine survival issues are likely to be significant. Research into marine factors is beyond the resources of ART alone. A collaborative Firth of Clyde sea trout project with neighbouring Trusts and DSFB's is logical considering on financial and staff resource requirements, as well forming an appropriate biological unit.
- 9.7 There is lack of knowledge of stillwater fish populations, other than anecdotal reports. Although established as a "Rivers Trust" it is impossible to operate on a catchment basis without an understanding of the ecology of the stillwaters therein. ART should now be in a position where it can devote some resources to investigating stillwater fish populations.

References

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List of Organisations

Abbreviation	Organisation	Website
AFT	Argyll Fisheries Trust	http://www.argyllfisheriestrust.co.uk
ART	Ayrshire Rivers Trust	www.ayrshireriverstrust.org
AST	Atlantic Salmon Trust	www.altanticsalmontrust.org
CCT	Catrine Community Trust	www.catrine-ayrshire.co.uk
CRF	Clyde River Foundation	http://www.clyderiverfoundation.org
DSFB's	District Salmon Fishery Boards	www.stincharfishing.co.uk
EAC	East Ayrshire Council	www.east-ayrshire.gov.uk
FC	Forestry Commission	www.forestry.gov.uk
FRS	Fisheries Research Services	www.marlab.ac.uk
FWAG	Farm and Wildlife Advisory Group	www.fwag.org.uk/scotland
LA's	Local Authorities (North, East and South Ayrshire Councils)	www.north-ayrshire.gov.uk www.east-ayrshire.gov.uk www.south-ayrshire.gov.uk
LBAP	Local Biodiversity Action Plan (Ayrshire and Arran)	http://www.south-ayrshire.gov.uk/community/LBAP/
LLFT	Loch Lomond Fisheries Trust	http://www.llft.org
NAC	North Ayrshire Council	www.north-ayrshire.gov.uk
NFU	National Farmers Union	www.nfus.org.uk
RAFTS	River and Fisheries Trusts Scotland	www.rafts.org.uk
RIAIA	River Irvine Angling Improvement Association	
SAC	Scottish Agricultural College	www.sac.ac.uk
SEPA	Scottish Environment Protection Agency	www.sepa.org.uk
SG	Scottish Government	http://www.scotland.gov.uk/Topics/Fisheries
SGRPID	Scottish Government Rural Payments and Inspectorate Department	http://www.scotland.gov.uk/Topics/Rural/SRDP
SNH	Scottish Natural Heritage	www.snh.org.uk
SP	Scottish Power	www.scottishpower.com
SW	Scottish Water	www.scottishwater.co.uk