Part 6 **Proposed Fisheries Management Actions**

6.1 Proposed aims and objectives

The Wester Ross Fisheries Trust's fisheries management plan addresses major problems that affect wild fish populations in the WRFT area. To reiterate: the aims of this fisheries management plan which will guide the work of the Wester Ross Fisheries Trust are as stated in Part 1, as follows (these are restated here for ease of reference):

Aim 1. To conserve the genetic diversity and structure of wild fish populations and the habitats that support them within the WRFT area. The main species of fisheries importance are Atlantic salmon and Brown trout (including sea trout). Some river systems support several discrete populations of salmon or trout. Wester Ross is also a stronghold for arctic charr with at least 20 poorly known populations within the WRFT area.

Returning an electro-fishing survey sample of juvenile salmon and trout to the Torridon River.

Aim 2: To promote the sustainable management of fisheries. Fisheries management is primarily about maximising fish production without in any way compromising the long-term health of the fish population or its ability to sustain a yield in the future. There is a need to ensure that stocks are not exploited to levels at which there are inadequate numbers of spawning fish. The 'catch and release' policy is a means of minimising mortality, and has been recommended and adopted by many salmon and sea trout fisheries and some brown trout fisheries in the area.

Aim 3: To foster wider benefits for other wildlife, biodiversity, ecology and the amenity of the area. Many other special animals, including Otter, Black-throated diver, White-tailed eagle, Osprey, many smaller birds, and insects (including carrion beetles, and in-stream invertebrates) will benefit from increasing returns of salmon and sea trout. Habitat restoration activities and possible trials to restore stream fertility should also support other vulnerable species, such as Freshwater pearl mussels.

Objectives

To achieve the aims outlined in above, ten '***objectives***' are listed below in order of priority, together with proposed '***actions'*** which are considered to be of 'high' priority to achieve the stated objectives. Note that many of the actions, which are listed in Table 6.1 and presented in detail in Part 6.2, will contribute to achieving several of the objectives presented.

Some of these actions are on-going WRFT activities. Other actions are currently being developed as new 'projects', many others remain aspirations awaiting further consideration, support and development. Provisional costings are presented on an accompanying Excel spreadsheet; please note that many of these are subject to on-going revision.

This part of the plan is where feedback is particularly welcome: what are your views regarding fisheries management priorities for the WRFT area? What actions would you support most?

Table 6.1 *Prioritisation of actions*

Action vs Objectives:											
	Objective	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	Actions	**Conserve salmon populations**	**Restore Loch Maree sea trout fishery**	**Restore salmon production**	**Restore sea trout production**	**Sustainable brown trout fishery**	**Charr fishery options**	**Lamprey & eel conserv-ation**	**Sea fish monitor-ing**	**Raise aware-ness**	**Monitor and review progress**
1	**River fish survey**										
1a	Timed e-fish survey	High	High	High	High			Medium		Low	
1b	Quantitative e-fish survey	High	Medium	High	Medium					Low	
1c	Spawning salmon survey & redd counts	Medium	Medium	Medium	Medium					Medium	
1d	Snorkel survey - juvenile fish	Low		Medium						Low	
1e	Snorkel survey - adult fish	Medium		Low						Low	
1f	Lamprey monitoring							High		Medium	
2	**Loch fish & fisheries survey**										
2a	Inventory gill netting	Low	High	Medium	Medium	Medium	High			Low	
2b	Hydro-acoustic survey	Low	High		Medium	Medium	High				
2c	Arctic charr spawning sites survey						High				
2d	Rod catch analyses (including Angler's log book)	High	High	High	High	High			Medium	High	
3	**Fish populations**										
3a	Tournaig project	High	Medium	High	Medium			Medium			
3b	Rotary screw trap	Medium	Medium	Medium	Medium	Low					
3c	FRS Shieldaig trap project		High		High			Medium	Low	Low	
4	**Genetic studies**										
4a	Loch Maree Wild Trout Project		High		High	High					
4b	Salmon population structuring	High		High							
4c	Arctic charr population structuring						Medium				
5	**Fish habitat survey**										
5a	River habitat baseline survey			Medium	Medium	Medium	Medium	Low			
5b	Loch habitat baseline surveys		Medium	Low	Medium	Medium	Low	Low			
6	**Riparian habitat survey**										
6a	Survey riparian vegetation and fauna		Medium	Medium	Medium	Medium		Medium		Medium	
7	**7. Invertebrate survey**										
7a	Baseline survey - (? Little Gruinard)			Medium	Medium	Medium				Medium	
8	**Fisheries management research**										
8a	Stream nutrient enhancement trial			High		Medium				Medium	
8b	Boulder placement - Rhidorroch River			Medium						Low	

Table 6.1 *Prioritisation of actions (continued)*

	Objective	1	2	3	4	5	6	7	8	9	10
	Action	**Conserve salmon populations**	**Restore Loch Maree sea trout fishery**	**Restore salmon production**	**Restore sea trout production**	**Sustainable brown trout fishery**	**Charr fishery options**	**Lamprey & eel conserv-ation**	**Sea fish monitor-ing**	**Raise aware-ness**	**Monitor and review progress**
9	**Remove obstructions**										
9a	River Sguod bridge culvert			Medium	High						
9b	2nd Coast road culvert				High						
9c	Docherty burn culvert and spawning channel		Medium		High						
9d	Water intake weir, Strath burn				Medium	Medium					
9e	Kerry culvert repairs				Medium						
9f	Slaggan burn				Medium						
9g	Allt beith fish ladder project			Medium	Medium						
10	**Improve productivity of fish habitat**										
10a	Upper Gruinard catchment	High		High	High						
10b	Rhidorroch River upper catchment	High		High							
10c	Loch Maree spawning burns		High	Medium		Medium					
10d	Tollie Burn habitat restoration		Medium			Medium					
10e	Strath burn fishery development project				Medium	Low					
10f	Upper Bruachaig - water abstraction review			Medium							
10g	Enhance FPM populations			Medium						Medium	
11	**Fisheries management meetings**										
11a	Broom	Medium		High	Medium					Medium	
11b	Gruinard	High		High	High					Medium	
11c	River Ewe	High	High	High	High	Low				Medium	
11d	Balgy	High		High	High					Medium	
11e	(?Carron)	Medium		Medium	Medium	Low				Medium	
11f	Glenmore & Glenelg (?hatchery)	High		High	High					Medium	
12	**Restoration and stocking programmes**										
12a	Kanaird	Medium		Medium	Medium					Low	
12b	Ullapool	Medium		Medium	Low					Low	
12c	Broom	Low		Low	Medium					Low	
12d	Dundonnell	Low		Medium	Medium					Low	
12e	Gruinard	Medium		High	Medium					Low	
12f	Ewe & Loch Maree	High	High	High	Medium					Low	
12g	Balgy	High		High	Medium					Low	
12h	Carron	Low		Medium	Medium					Low	
12i	Elchaig and Ling	Low		Medium	Medium					Low	
12j	Glenmore and Glenbeag (Glenelg)	High		High	Medium					Low	

Table 6.1 *Prioritisation of actions (continued)*

	Objective	1	2	3	4	5	6	7	8	9	10
	Action	**Conserve salmon populations**	**Restore Loch Maree sea trout fishery**	**Restore salmon production**	**Restore sea trout production**	**Sustainable brown trout fishery**	**Charr fishery options**	**Lamprey & eel conserv-ation**	**Sea fish monitor-ing**	**Raise aware-ness**	**Monitor and review progress**
13	**Sea lice monitoring and AMAs**										
13a	Post-smolt sea lice : Dundonnel & Poolewe		High		High					Medium	
13b	Sea trout sweep netting		High		High				Medium	Medium	
13c	Rod and line sea trout sampling		High		High					Medium	
13d	Area Management Groups	High	High	High	High				Medium	Medium	Medium
14	**Monitor marine ecosystem . . .**										
14a	Seal monitoring & management groups		High	High	High				Medium	Medium	
14b	Sea life monitoring(collaborative project . . .)		Medium		Medium				Medium	Medium	
14c	Sea bass monitoring (collaborative project . . .)								Medium	Medium	
14d	Pollack monitoring (collaborative project . . .)		Medium		Medium				Medium	Medium	
14e	Herrings (collaborative project . . .)								Medium	Medium	
14f	Rays and Skate - monitoring (collaboarive)								Medium	Medium	
15	**Fisheries monitoring and development**										
2d	Rod catch analyses (including Angler's log book)	High	High	High	High	High			Medium	Medium	
15a	Fisheries Development Officer	Medium	Medium	Medium	Medium	Medium	Low	Low	Medium	Medium	Medium
15b	Fisheries Protection	High	Medium	High	Medium	Low					
16	**Education**										
16a	Salmon in the classroom	Medium	Low	Medium	Low	Low		Low		High	
16b	Life in lochs and lochans		Medium		Medium	Medium	Medium			High	
16c	Student projects	Medium	Medium	Medium			Medium	Medium	Medium	Medium	
16d	Work experience placements			x					Medium	Medium	
16e	Loch Maree Open Day	Medium	Medium	Medium	Medium	Medium				High	Medium
17	**Awareness**										
17b	Newsletter and Annual Review	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	High	Medium
17c	Web site	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	High	Medium
17a	Leaflets and angler info	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	High	
17d	Poster, T-shirt & booklets	Low	Low	Low	Low	Low	Low	Low	Low	Medium	
17e	Loch Maree Fisheries & Wildlife Interpretation Centre	Medium	Medium	Medium	Medium	High				Medium	Medium
18	**Training**										
18a	Electro-fishing training	High	High	High	High			High			
18b	Boat handling training	Medium	High	Medium	High	Medium	Medium		Medium		
18c	Computer skills update	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium		
19	**Review fisheries management**										
19a	Update fishery management plan	High	High	High	High	Medium	Medium	Medium	Medium		High

Objective 1 **Conserve wild salmon populations**

Wild, locally adapted, salmon populations are the fundamental genetic units upon which the salmon fisheries of the WRFT are based. To maximise the likelihood of populations surviving and remaining productive (i.e. able to produce a harvestable surplus), population units should be identified for management purposes. If particularly vulnerable (i.e. small) populations are identified, they should be given special protection.

Actions considered as being of high priority to achieve this objective are as follows:

1a Timed e-fish survey
1b Quantitative e-fish survey
2d Rod catch analyses
3a Tournaig project
4b Salmon population structuring (genetic studies)
10b Improve fish habitat along the Rhidorroch River
10a Improve fish habitat in upper Gruinard catchment
11a Annual fishery management meeting Gruinard River
11b Annual fishery management meeting River Ewe
11c Annual fishery management meeting River Balgy
11d Annual fishery management meeting Glenmore and Glenbeag Rivers
12f Support for Ewe – Loch Maree stock restoration programme
12g Support for River Balgy stock restoration programme
13d Area Management Groups
14 Seal monitoring and management (in Loch Ewe)
15d Fisheries protection
18a Electro-fishing training
19a Review and update fishery management plan

Objective 2 **Restore the Loch Maree Sea trout population and fishery**

The Loch Maree sea trout fishery was and remains potentially the most important freshwater fishery within the WRFT area. Restoration of the sea trout population would be of greater benefit to the local economy and wildlife (Loch Maree is an SPA for breeding Black-throated divers which feed on small trout) than restoration of any other fishery. On this basis, restoration of the Loch Maree Sea trout population and fishery has been given high priority.

Actions considered as being of high priority to achieve this objective are as follows:

1a *Timed e-fish survey*
2a *Inventory gill netting*
2b *Hydro-acoustic survey*
2d *Rod catch analyses*
3c *FRS Shieldaig trap project*
4a *Loch Maree Wild Trout Project (genetic assessment)*
9c *Make culvert under road in Glen Docherty passable for sea trout and create spawning channel*
10c *Loch Maree spawning burn habitat improvement*
11b *Annual fishery management meeting River Ewe*
12f *Support for Ewe – Loch Maree stock restoration programme*
13 *Sea lice monitoring and Area Management Groups (all actions)*
14 *Seal monitoring and management (in Loch Ewe)*
18a *Electro-fishing training*
18b *Boat handling training*
19a *Review and update fishery management plan*

Objective 3 **Restore & enhance wild salmon production in areas where stocks have been lost to support fisheries**

Juvenile salmon populations have been lost from the accessible headwaters of some river systems. In other rivers, densities and growth rates of juvenile salmon are low. Within the WRFT area, actions aimed at restoring salmon production are currently required for the following rivers (in order of priority): upper Bruachaig (Ewe), upper Gruinard, upper Glenmore River, Glenbeag River, Rhidorroch River (Ullapool), Balgy River, River Elchaig.

Actions considered as being of high priority to achieve this objective are as follows:

1a Timed e-fish survey
1b Quantitative e-fish survey
2d Rod catch analyses
3a Tournaig project
4b Salmon population structuring (genetic studies)
8a Stream nutrient enhancement trial
10b Improve fish habitat along the Rhidorroch River
10a Improve fish habitat in upper Gruinard catchment
11a Annual fishery management meeting Gruinard River
11b Annual fishery management meeting River Ewe
11c Annual fishery management meeting Balgy
11d Annual fishery management meeting Glenmore and Glenbeag
12f Support for Ewe – Loch Maree stock restoration programme
12g Support for River Balgy stock restoration programme
13d Area Management Groups
15d Fisheries protection
18a Electro-fishing training
19a Update fishery management plan

Objective 4 **Restore sea trout production to support fisheries**

There are many rivers where sea trout production could be enhanced. These include sea trout fisheries in the following river systems: Kanaird, Broom, Gruinard, Second coast, Slaggan Burn, Allt Beith, Tournaig, other parts of the Ewe system, Sguod, Strath mill (Gairloch), Torridon, Balgy, Shieldaig, Cuaig, Applecross, Carron, Elchaig, Croe, Shiel, Glenmore and Glenbeag.'

Actions considered as being of high priority to achieve this objective are as follows:

1a *Timed e-fish survey*
2d *Rod catch analyses*
3c *FRS Shieldaig trap project*
9a *Improve River Sguod bridge culvert*
9b *Make 2nd Coast bridge culvert passable*
10a *Improve fish habitat in upper Gruinard catchment*
13 *Sea lice monitoring and Area management groups (all actions)*
14 *Seal monitoring and management (in Loch Ewe)*
18a *Electro-fishing training*
18b *Boat handling training*
19a *Update fishery management plan*

Objective 5 **Develop opportunities for sustainable wildlife-friendly wild trout fishing**

A series of recommendations were made in the The Wester Ross Wild Trout Project (2006 – 2007) Report which remain valid for the purposes of the current FMP.

Of the actions listed in this FMP, those that are considered to be of highest priority to achieve this objective area as follows:

2d Rod catch analyses (including anglers log book scheme)
4a Loch Maree Wild Trout Project (Genetic studies of trout populations)
17a Newsletters and Annual Review
17b Web site: to include guidance for trout anglers
17c Leaflets and angler information

Objective 6 **Assess options for developing a sustainable Arctic charr fishery**

Before Arctic charr can responsibly be promoted as a species of fisheries interest within the WRFT area, much more needs to be known about charr populations within the area.

Actions considered as being of high priority to achieve this objective area as follows:

2a Inventory gill netting
2b Hydro-acoustic survey
2c Arctic charr spawning sites survey
17a Newsletters and Annual Review
17b Web site: to include guidance for trout anglers

Objective 7 **Lamprey and eel conservation**

Of the other freshwater fish species in the WRFT area, only eels are known to have been exploited in the past. Actions in Wester Ross should contribute to wider efforts to conserve these species.

Actions considered as being of high priority to achieve this objective area as follows:

Lamprey conservation:

1f Lamprey e-fishing survey
17b Website

Eel conservation:

1a Timed electro-fishing survey
3a Tournaig trap project
17b Website

Objective 8 **Sea fish monitoring**

Monitoring of fish in the sea is normally out with the remit of WRFT. However, for certain inshore fish species of local interest, there is little other monitoring. WRFT, with an office located at Gairloch harbour adjacent to wildlife tour operators, may be in a good position to offer support to other local groups or agencies that also wish to gather information on the status of important local stocks.

The only action which is present here as being of high priority is:

14e Monitor herring spawning site west of Melvaig

This is in view of an absence of monitoring by any other agency and the importance of juvenile herring in the sea lochs of the area as a food source for sea trout, and other wildlife. Other actions of medium priority to WRFT which are primarily relevant here are:

14c Sea bass monitoring (sea bass are treated as a 'freshwater' fish in Maitland, 2007)
14d Pollack monitoring (pollack may predate sea trout; they are an angling quarry of value)
14f Ray and skate monitoring (likely to spawn within the area; of local value to anglers)

All these actions are proposed as collaborative projects where WRFT acts as the facilitator or in partnership with another organisation. Note that many anglers who come to the area to fish for salmon and trout are also enthusiastic sea anglers.

Objective 9 **Raise awareness of wild fisheries and their management needs**

Actions considered as being of high priority to achieve this objective area as follows:

2d Rod catches analyses (and Anglers Log book scheme)
16a Salmon in the Classroom (school project)
16b Life in Lochs (school project)
17a Newsletter and annual review
17b Web site
17c Leaflets and angler info

River management meetings (listed under 15) and AMG meetings 13d also contribute to raising awareness of management needs [?elevate to high priority]

Objective 10 **Monitor and review progress**

This is an ongoing activity (e.g. fish surveys in rivers and lochs). The main direct action here is to:

19a Review and update fishery management plan.

6.2 Actions

6.2.1 Introduction

To achieve the objectives set out above, 79 actions, grouped under 19 headings, have been developed. These are intended to guide the WRFT work programme over the next 5 years. An excel spreadsheet has been prepared for each group of actions in which the costs of each action are detailed. This spreadsheet will be reviewed and up-dated when detailed costings are required.

The heading groups are as follows:

1. River fish surveys.
2. Loch fish surveys.
3. Fish population studies.
4. Genetic studies.
5. Fish habitat survey.
6. Riparian wildlife survey.
7. Invertebrate survey.
8. Fisheries management research.
9. Remove obstructions.
10. Improve productivity of fish habitat.
11. Fisheries management meetings.
12. Restoration and stocking programme.
13. Sea lice monitoring and AMAs.
14. Monitor marine ecosystem.
15. Fisheries monitoring and development.
16. Education.
17. Awareness.
18. Training.
19. Review fisheries management

Some of the actions involve monitoring and survey work; others practical actions; included are education and awareness raising activities. Most actions contribute to more than one objective, as shown in Table 6.1 *(back of section for now)*.

The notes below have been prepared to accompany tables with breakdown of initial cost estimates presented in the accompanying excel spreadsheet (presented at the back of this section).

Group 1 **River Fish surveys**

Up-to-date information describing the occurrence, distribution and abundance of fish populations in the area is essential to inform a wide range of fisheries management objectives.

1a Timed electro-fishing survey
1b Quantitative electro-fishing survey

Each year the WRFT e-fishing team will aim to visit 12 river systems and assess the distribution and relative abundance of juvenile fish. Juvenile salmon are the target species for most surveys. Eel, trout, minnow, flounder, stickleback and lamprey are also recorded if encountered. The e-fishing team comprises of an SFCC qualified 'team leader' and one SFCC trained assistant. Additional helpers (usually in-kind helpers from estate or local angling club) are sometimes required.

'Capital' expenditure includes training costs, waders, stop net repairs, and other materials.

In total, 25 e-fishing team-days are scheduled each year between July and October (inclusive). Where possible, rivers are revisited at the same time in the calendar year as previous surveys. However, this is not always possible. Some sites are revisited each survey; others are chosen on the day of survey according to information about the current status of the fish populations, guidance from local fishery managers, and river and weather conditions. It is not always possible to carry out surveys in ideal conditions or the same fishing conditions from one year to the next.

Fully quantitative multi-run fishings using stop nets are more expensive in terms of manpower and the time it takes to complete each site. For management purposes, the additional precision gained for estimates of fish density has generally contributed little to the overall understanding of the health of fish stocks in the river and management needs. When time is limited, a judgement is usually made to survey many sites using 'timed' protocol (up to 10 in a day) than a few sites using 'fully quantitative protocol' (typically 4 in a day). The nominal 10 'fully quantitative sites' are still to be agreed, pending further discussions with SEPA, SNH and FRS.

Reports are drafted in the winter months primarily to inform river proprietors, fishery managers and other stakeholders with an interest in the results of the surveys. Ten office biologist days per years have been budgeted for here.

These surveys are considered to be of high priority for objectives 1 to 4 (salmon and sea trout conservation and production) and of medium priority for objective 7 (lamprey and eel conservation).

The capital cost presented here includes annual servicing of equipment.

1c Spawning salmon and sea trout survey & redd counting

A nominal 4 days per year is scheduled for observing salmon and sea trout spawning and 'redd' counting. The costing is based on field rate of WRFT Biologist plus assistant.

Areas targeted include headwater streams where there is variation in the number of fish spawning from one year to the next. In recent years, Loch Maree spawning burns and headwaters, including the Kinlochewe River and Loch Bharranch burn, have been surveyed.

In previous years, the River Kerry was also surveyed.

Note that this action is considered to be of medium priority with respect to objectives.

1d Snorkel survey – juvenile fish

Salmon parr were recorded in pools in the Lower Rhidorroch River by snorkel surveying in 2004. Snorkelling has also been tested in parts of the Little Gruinard with less success due to poor visibility.

The costing is based on WRFT Biologist field rate plus assistant.

Note that this action is considered to be of medium priority with respect to objectives.

1e Snorkel survey – adult fish

This is to assess numbers of salmon in specific places at specific times of year. Two days per year have been scheduled. For this to be successful, water levels must be low and clear. Places where snorkelling may provided useful information include: Ness Pool (below falls) in Ullapool River end of May (assess numbers of early entering fish); Bathing Pool, Abhainn Strath na Sealga (September); Glen Beag River.

In 2002 – 2004 the River Kerry was snorkel surveyed prior to the salmon spawning period; this was discontinued because it was concluded that numbers of salmon in the river were underestimated from the snorkel count.

The costing is based on WRFT Biologist field rate plus assistant for two days per year (average).

Note that this action is considered to be of medium priority with respect to objectives.

1f Lamprey survey

This is to assess the Lamprey populations in the River Carron. The River Carron is the only river in WRFT area where Sea lampreys have been recorded. Brook lampreys are also present. The survey would initially seek to confirm the presence of *Sea lamprey* ammocoetes, then to focus on assessing the distribution of *Lampetra* sp (or spp.?).

The costing is based on one day @ electro-fishing team rate every two years.

Group 2 **Loch fish & fishery surveys**

2a Inventory gill netting

In 2005, WRFT commissioned an inventory gill net survey of Loch Maree to find out about the diversity and distribution of fishes in the loch. The survey was led by Ron Greer and was a success in many respects.

WRFT has little information about fish populations in other lochs. Lochs where surveys are proposed are: Loch Achall, Loch na Sealga, Fionn Loch, Loch Maree (three basins), Loch Clair, Loch Damh, Loch Dughaill and Loch Sgamhain. The schedule is for two lochs to be surveyed each year.

Surveys have been costed based on the 2005 commission. More detailed costings will be developed.

2b Hydro-acoustic survey

In 2007 FRS surveyed Loch Maree and the Fionn Loch using new hydro acoustic survey equipment, incorporating side scan. Results suggest that the hydro-acoustic surveying of lochs may be useful particularly with gill netting to confirm the identity of fish recorded.

The initial costing presented is for two days of WRFT biologist office time and 2 days of assistant field time to support a FRS survey team. Further work with FRS is required to develop a firmer proposal and costs.

2c Arctic charr spawning survey

There are at least 20 Arctic charr populations within Wester Ross, making the WRFT area one of the most important for charr diversity within the UK. Only two spawning sites are currently known for arctic charr, both in streams.

To protect populations, and to monitor their health, some knowledge of recruitment is required. At the Arctic charr discovery week in 2006, PhD student Jon Low demonstrated the methods he's used successfully in Ireland to identify spawning sites.

WRFT proposes to commission a study of charr spawning sites, initially to find the whereabouts of charr spawning areas in Loch Maree where two distinct populations exist.

Based on an experienced biologist and two week survey, with assistant (health and safety), the cost of a three week survey using fyke nets and snorkelling is likely to be in the order of £3,000 to £5,000. A more detailed costing will be developed following further discussions with charr specialists.

Meanwhile, a second Arctic charr discovery week has been sheduled for 22nd – 29th November 2008 at which a workshop to adress priorities for Arctic charr conservation and fisheries management will be held.

2d Rod catch analyses

All fisheries proprietors complete a catch return each year. These are sent to the Scottish Government's Fisheries Research Services. WRFT request copies to be sent to the Trust or the WRASFB. Although reminders have periodically been sent to proprietors, few retiurns are received in a timely manner each year. Much time is required to phone around keepers and ghillies or river owners to obtain fish catch information. One problem is that those who fill in the return do not always have access to a photo copier. This is inefficient use of time and resources.

If WRFT is to provide analyses of rod catches, then a new system is required to record and return catch information.

WRFT suggests all catch returns should initially be sent to the local DSFB for local, timely, preliminary assessment of catches, then by the board to FRS. Most estates now have access to a computer: catch return forms could be completed on-line (c. new Scottish Rural Development Programme application methods

In 2003-2004, WRFT launched a Wild Trout Project angler's log book scheme with some but limited success. The costing here is for 4 biologist office days to collate and analyse catch returns each year.

Group 3 **Fish population studies**

3a Tournaig Project

The Tournaig trap project was established in 1999 and provides detailed information about both salmon and trout populations and production in a small river system adjacent to the River Ewe. The traps are opportunistically located in a fish ladder enabling easier operation than at most other potential trapping sites. The numbers of descending smolts and ascending adult fish are recorded. In addition, an electro-fishing survey is carried out each year, the results of which can be compared with trap catches to understand escapement targets and recruitment. The traps provide information (e.g. growth rates) about the performance of fish both within the freshwater environment and the marine environment.

Currently, investigations are focusing on the recolonisation of the system by stray salmon since 2002, with support from the FRS genetics lab (Dr Eric Verspoor). This information is useful for understanding management needs (e.g. whether stocking is required to restore a viable population). A paper is currently in preparation: the results of the analyses of samples submitted to FRS Genetics lab are awaited; the origin of the grilse recorded entering the system in 2007 will be assessed via genetic analyses to confirm whether or not the colonization by stray salmon in 2003-4 has lead to formation of a new self-sustaining population.

WRFT would seek to continue to operate traps throughout the year (in practice this can mean 11 out of 12 months: the trap is decommissioned during very high winter water levels). Additional funding would be required to process scale samples and genetic samples.

The estimated cost presented is based on the bid to Scottish Government in December 2007. Figures have been rounded.

3b Rotary screw trap

There is an opportunity to learn more about the Loch Maree sea trout populations (the largest in the WRFT area) and River Ewe salmon populations through capture of samples of smolts as they migrate to sea in March and May (and indeed learn about the timing of migrations) in a screw trap. An earlier deployment date would enable marking of over-wintered finnock and kelts.

The aim would be to learn about the survival and growth rates of marked fish, though the value of screw traps for quantitative work requires careful consideration. This information would contribute to an understanding of the sea trout population(s) including over-wintering, and to stocking and other management requirements. Information relating to smolt migration through Loch Maree could be obtained if samples were also marked within the upper catchment.

We would need to hire a screw trap(s), operate the screw trap for 10 weeks (minimum) with daily checks, mark or tag fish (visible implant tags may be preferable), training in tagging, and carry out scale reading and report preparation.

Marked fish might then be caught up during sweep netting in Loch Ewe or in angler's catches in the River Ewe system.

The costing presented is based on the bid to the Scottish Government for AMA funding in December 2007. Figures have been rounded.

3c FRS Shieldaig trap project

This has been included here as a reminder of complimentary studies in Loch Torridon. It is important that WRFT is kept abreast with FRS research at Shieldaig. In past years the WRFT has provided assistance to the project (for a few hours at a time). FRS Shieldaig staff have assisted with WRFT work (e.g. Loch Maree Open Day, helping with sweep netting). This arrangement is healthy and beneficial for both partners, and for fisheries management in the area and the links should continue.

The cost presented here is for the WRFT Biologist to spend up to two days per year in total assisting with the project, or simply discussing research, monitoring and related information.

In total, about 2 days of WRFT biologist per year. This is reciprocated in kind by the FRS Shieldaig biologist. In previous years the Tournaig trap operator has also had an 'exchange' visit to the Sheildaig trap; this is good for compare notes, for developing ideas for new studies, and good for morale.

Group 4 **Genetic studies**

4a Loch Maree Wild Trout Project

WRFT currently has a collaboratively project **'Loch Maree Wild Trout Project'** which aims to identify all trout populations within and above the area accessible to sea trout in the River Ewe catchment area. The aim of the project is to identify management needs for fisheries and for conserving any special trout populations. The Brown trout (*Salmo trutta*) has recently been added to the UK Biodiversity Action Plan Priority Species List.

The main collaborating partners are Fisheries Research Services (Dr Eric Verspoor), Middlesex University (Dr Steve Kett and PhD student Calum Button), and University of Highlands and Islands (Bob Kindness). The main expense is for DNA analyses of samples at the FRS Genetics Lab at Faskally. The Wild Trout Trust has recently offered a contribution of £1,500 to the project. Analyses of sea trout samples at the FRS Genetics lab will cost in the order of an additional **£10,000- £15,000**.

Further details of the project are presented in Box 9.4.1 below. Additional funding is required to cover the costs of analyzing samples which is not included in this budget.

The cost presented is for the part that WRFT contributes to: obtaining samples. Two days biologist field-time have been allocated to this project, other samples will be collected by other members of the team.

Box 6.4.1 *Loch Maree Wild Trout Project*

A natural river system
The River Ewe-Loch Maree complex is one of the most important and most natural freshwater systems in Scotland. The catchment area, comprising many mountains and lochs, supports an impressive diversity of native wildlife. The Caledonian woods of Beinn Eighe National Nature Reserve represent a remnant of an ancient forest of pine trees known to be genetically discreet from the Scots pines of the Cairngorms and Speyside. Golden eagles and White-tailed eagles fly overhead.

Loch Maree is of 'Special' conservation importance as a breeding site for Black-throated diver and Otter. The loch also supports populations of European eel, Atlantic salmon, two types of Arctic charr and wild Brown trout.

Biodiversity of wild trout
During the 20th Century, Loch Maree was world renown for its sea trout fishing and produced a Scottish record sea trout of almost 20lb in the 1950s. Loch Maree also supports a wide variety of other forms of trout. 'Cannibal' trout ('ferox') may reach weights of 5kg (12lb) or more. In contrast, little mountain stream 'brownies' above insurmountable waterfalls may grow to no more than 15cm (6 inches) in length.

The Loch Maree Wild Trout Project will address the following questions:

- How many different kinds of wild trout are there?
- How are they related to each other?
- To what extent have ancestral trout populations been retained?

Unravelling variation within a species
Expeditions visit lochs, lochans and hill streams in search of unique populations of wild trout. Local and visiting anglers are invited to help. Trout are caught using rod and line, electro-fishing equipment and nets. All fish are measured, aged and photographed to compare their appearance and morphology. Samples of DNA are collected for genetic analyses. The extent and distribution of discrete wild trout populations within the catchment area will be mapped, along with respective spawning areas.

A collaborative approach
This exciting study is the first of its kind within the UK and will provide detailed information about the genetic status and conservation and management needs of wild trout in a relatively undisturbed part of Scotland.

The project is being developed by Dr Steve Kett of Middlesex University, Dr Eric Verspoor of Fisheries Research Services and Peter Cunningham of Wester Ross
Fisheries Trust, in partnership with local estates and angling interests.

Additional support is being provided by from Bob Kindness of Seafield College and the University of Highlands and Islands. A PhD student will undertake much of the analytical work, based at the FRS Freshwater Laboratory near Pitlochry.

Progress to date
Genetic analysed to date indicates the occurrence of at least 6 'haplotypes' (maternal lineages) of trout within the River Ewe catchment, including one which may be new to Scotland. Further samples were collected during the summer of 2007 from sea trout taken at the mouth of the River Ewe, juvenile trout in tributary streams, and brown trout in streams above insurmountable falls. Subsequent analyses will clarify relationships between trout in nursery areas and adult populations.

The project is part-funded by The Wild Trout Trust and The Highland Council.

4b Salmon population structuring

In parallel with the Loch Maree Wild trout Project, WRFT aims to identify genetically discrete salmon populations, again with a primary aim of being able to inform management (e.g. Bruachaig restoration programme) and the conservation of any unusual or particularly valuable populations e.g. populations tending to produce 'spring' salmon. WRFT would seek to identify priority populations within the WRFT area; the FRS - TWG may have its own priorities for identifying priority salmon populations at regional or national level. WRFT would seek to collaborate with FRS and other partners.

Samples of salmon are routinely collected during electro-fishing surveys, so the only additional costs are for time taken to catalogue and transfer samples to FRS.

Costing:

2 days WRFT Biologist time per year for sample collection, cataloguing and delivery to FRS.

4c Arctic charr population structuring

Samples of arctic charr were taken by visiting charr specialists in 2006 (Arctic charr discovery week) and 2007 (Ron Greer – Loch Maree and Loch na Sealga; Eric Verspoor – Coulin population).

It is proposed to continue to work in collaboration with other charr specialists and agencies to build up a better understanding of charr populations in Wester Ross.

Samples of charr may be obtained from inventory gill netting (Action 2.1) and Arctic charr survey of spawning sites (samples of eggs). WRFT will continue to provide assistance where needed to other sampling teams.

Costing: 1 day WRFT Field Biologist per year. Costs for Inventory gill netting and charr spawning survey are presented elsewhere.

Group 5 **Fish habitat surveys**

5a River habitat survey

These surveys provide the basic information describing the accessible area for salmon and sea trout, locations of obstacles to fish, spawning habitat and habitat suitable for salmon parr, locations of holding pools, the condition of river banks and riparian areas. They are the basis for developing recommendations for stocking (e.g. numbers of fish to stock) and habitat restoration projects where applicable.

River habitat surveys have been completed for all the major rivers in the WRFT area, except for some 'southern' rivers. Surveyors have passed the SFCC Habitat survey training course, and the protocol followed follows or is closely based on the SFCC protocol.

Data has been worked up into fisheries management plans for all rivers except the following:

Little Gruinard, Torridon, Applecross

Further south, 'walkover' habitat surveys have been carried out on the Arnisdale and a report completed.

The following rivers have not been surveyed:

Elchaig, Croe, Shiel, Glenmore, Glenbeag (part surveyed), Kinlochhourn (lower priority); Barrisdale (low priority).

The costing here is for four WRFT Biologist field days per year for river surveys, and two days per year to prepare habitat survey summary reports following surveys. These reports may be included within juvenile fish survey or fishery management reports for respective rivers.

The aim is to complete all surveys within the south of the WRFT area within the 5 years of the plan. Funding received from LTCS for habitat surveys has been drawn down, ENTRUST agreed to support production of river habitat reports in addition to field survey work as outlined on the grant application. If additional funding becomes available, habitat surveys for southern rivers may be completed more rapidly than scheduled.

5b Loch habitat baseline survey

Few lochs have been habitat surveyed in much detail by WRFT. Exceptions include Loch Achaidh na h-Inich (Scottish water contract) and Lochan nam Breac (Wild trout Project). Loch Dughaill (Shieldaig) has been surveyed in detail by FRS. Some of the Gairloch Hill lochs were surveyed by a volunteer for the Wester Ross Wild Trout Project.

There are many hundreds of lochs in Wester Ross and relatively little is known about fish habitats within them, and of management needs. Interest in diversity of habitats within freshwater lochs is shared with conservation agencies (SEPA &SNH).

Lochs priorities for surveying may include those of importance for charr or juvenile trout production. Some lochs may have fish spawning areas within them; such habitat could be quantified for the purposes of assessing management needs if any.

This project is proposed as a collaborative venture possibly dependent upon sourcing additional funding. Protocols developed for the Wester Ross Wild Trout Project could be reviewed and adapted if appropriate.

The initial costing is based on work carried out at WRFT Biologists rate. Other options include training of an assistant biologist to carry out some of the survey work or subcontracting part of the work to a third party.

Group 6 **Riparian wildlife surveys**

6a Survey riparian vegetation and fauna.

WRFT field teams reach places where other field teams seldom venture. These surveys are intended to provide supplementary information of relevance to the productivity of rivers in Wester Ross, which was not collected in the first round of habitat surveys.

Information to be collected includes (presence / absence) moles, earthworms, New Zealand flatworm, other soil fauna; and to record tree species present and other vegetation.

This information can be recorded at the time of electro-fishing surveys in the summer. The provisional costing is based on 0.2 of a field day x 24 days at WRFT biologist rate.

A small amount of capital may be required for purchasing tools (e.g. trowel) and producing and printing record sheets.

This project may be developed further in collaboration with other partners, e.g. 'molewatch' (led by the Mammal Trust UK), the imminent 'national earthworm survey' (led by Natural History Museum), and Aspen survey (Scottish Native Woods – currently restricted to Strathspey).

Group 7 **In-stream invertebrate sampling studies**

7a Study of invertebrate larvae (in the Little Gruinard River catchment)

In March 2007, WRFT held a Stonefly and Mayfly training workshop in its office led by Dr Craig Macadam. Subsequently, kick-net samples of instream invertebrates were recorded at the time of electro-fishing surveys visits to rivers in 2007.

Results have yet to be analysed in detail. Little variation was recorded in the distribution of common taxa at levels which could be useful for fisheries management purposes. This contrasts with work carried out by the Ayrshire Fisheries Trust who demonstrated much variation the invertebrate fauna in Ayrshire streams associated with variability in water quality due to effluents from mines, factories, agriculture and domestic sources.

From a Wester Ross fisheries management perspective one purpose of invertebrate sampling is to learn about food availability. How does catchment management affect this? Rather than sampling sites widely across the WRFT area, the proposal presented here is to focus on a single river catchment area and learn in more detail how the distribution and abundance of stream invertebrate relates to that of juvenile salmon and fish growth.

This has been initially costed as a one-off survey of one catchment – 5 days at Biologist rate – in March. Alternatively, funding could be sought to support a PhD student.

The Little Gruinard Salmon SAC catchment area is proposed for the following reasons:

1. detailed electro-fishing data is available
2. surveys suggest that the growth of juvenile salmon in the river is related to food availability
3. the river has 'special' conservation status for salmon.
4. other terrestrial invertebrate work has been carried out (graduate student Paul Tinsley-Marshall).

The project requires further development and agreement of all parties and could be carried out in any year of the 5 year programme.

Group 8 **Fisheries Management research projects**

Three new project proposals are outlined here. These all need to be developed and fully-costed. All are proposed as collaborative projects with support or guidance from FRS or University scientists.

8a Stream nutrient enhancement trial

In November 2007, WRFT held an ecosystem fertility seminar in Gairloch. Participants agreed with the conclusion that catchment areas of rivers in Wester Ross are not pristine, and that levels of fertility had dropped.

Experimental studies in the neighbouring River Conon catchment demonstrated an increase in juvenile salmon biomass in areas fertilised with salmon carcasses (Williams, 2007). This proposal is to develop a fisheries management scale stream fertilisation trial in Wester Ross, to develop guidelines for fisheries managers for areas where levels of fertility have evidently fallen.

The initial costing is for development of the project proposal, including more detailed costings.

8b Boulder placement project, Rhidorroch River

The lower Rhidorroch River is very unstable. The streambed sediment is too small in size or in-filled along much of the river providing little void space for salmon parr to find protection. Trout are known to predate salmon parr in the river. Problems and anthropogenic causes (heavy grazing pressure) are discussed in Part 5.

One simple cost-effective approach to improving an area of habitat for salmon parr production may be to add boulder sized stones to a section of the channel and monitor whether salmon parr subsequently make greater use of the modified habitat. Similar techniques have been used elsewhere. This project requires further development including discussions with the proprietor.

The initial costing is for the development of a project proposal, including more detailed costings.

8c River Ewe spring salmon radio-tracking project

In 2001-2002, WRFT carried out a radio-tracking project to follow the movements of rod caught salmon in the River Ewe system. One of the aims of the project was to determine the spawning destination of salmon taken by anglers at different times of year. Unfortunately, no fish were taken in the River Ewe itself before July.

This project is being developed to focus on the spawning destination and success of earlier entering fish. In most years small numbers of salmon are taken in the River Ewe in May. Do these fish all head for the upper parts of the river system, or do some of them stay lower down within the system?

The initial costing is for development of the project proposal, including more detailed costings.

Group 9 **Remove obstructions to fish migration**

There are relatively few major manmade obstructions to fish passage in the WRFT area. Many of those on major river systems were highlighted in respective River FMPs in the past. However, some of the small river systems have obstructions which appear to be in breach of CAR regulations and need to be rectified. Offending culverts are situated as follows (none of these require digging up the road: solutions can be found by attaching concrete baffles inside the pipes or on the concrete apron under the bridge):

9a **River Sguod** (below Loch Sguod)

The culvert beneath B8057 at NGR 181800 887800 is difficult for salmon and sea trout to get over: too wide and smooth so water shallow and difficult for fish to jump on to culvert. This could be relatively easily improved.

The costing here is for 2 days of WRFT biologist time to consult with a Highland Council road official or other person to agree a solution. Funding will need to be sought from elsewhere to modify the culvert.

[pictures]

9b **Allt Bad an Luig** (near Second Coast)

The culvert beneath A832 at NGR 193050 890300 is impassable to salmon and – pipes too steep, and pool required below culvert to allow access. The area pf habitat for salmon and sea trout above this culvert includes 15,000m^2 of riverine habitat and at least one loch (Loch na h-Uidhe) of area 8-10 ha. This is therefore a substantial area of salmon and sea trout habitat which is cut off. I've yet to check whether Loch Fada might also be accessible, if so the, culvert is potentially obstructing access to a large sea trout system.

The culvert has already been inspected by John Webb (AST Biologist) to discuss possible solutions.

The costing here is for a further 2 days of WRFT biologist time to discuss and develop plans with a HC representative / engineer.
Note the nearby: **Sand Burn (Laide):** culvert at NGR 190350 891800 is possibly impassable to salmon and sea trout which were formerly able to access as far upstream as Loch na Greige in Laide wood. This should also be reassessed.

9c **Glen Docherty Burn**

The new culvert beneath A832 at NGR 205750 860250 to a small trout spawning stream is impassable – pipe too long and steep. The WRFT biologist discussed plans with the design engineer prior to construction of the new road; with the aim of establishing a substantial area of trout spawning habitat. Unfortunatly, trout from the Docherty burn cannot currently access this habitat. A potential solution has been considered with help from John Webb (AST biologist) which does not involve major reconstruction work.

The main stream can be diverted into a ditch (will need excavated) to the next culvert downstream which is shorter and could be more easily made passable with placement of baffles through the pipe, thereby creating a trout (and sea trout) spawning channel of several hundred metres.

9d Old water intake weir, Strath Burn.

There is also an old water intake weir (marked as a 'Dam' on OS Explorer [1:25,000] sheet 434) at NGR 180900 880400 which is no longer in use (and unlikely to be used again) which should be made passable. Gairloch Angling Club members could make the weir passable in an afternoon using sledgehammers! Or else, a simple fish pass could be provided if the structure is to be retained.

The costing of 1 WRFT Biologist day should be sufficient to remove the offending weir – pending agreement of Scottish Water and other stakeholders.

9e Allt Dhonnachaid culvert under A832, by River Kerry

Wooden baffles were fitted to the apron of this culvert in the past (?2000) to improve fish access. These need to be replaced; concrete baffles would be longer lasting.

The costing is for one day of WRFT biologist's time to organise the repair.

9f Slaggan burn weir clearance

The Allt an t-Slagain is potentially passable to sea trout from the sea to Loch an t' Slagain. The only blockages are old man-made weirs (boulder piles). At high flows, ascending fish may be able to swim over them; at low flows (e.g. during smolt migration period) fish moving downstream are likely to be obstructed as water percolates through the stones

A half day of WRFT biologist time has been allocated to this project – agreement of all parties, including the fishery proprietor, is required to progress this action.

9g Allt Beith fish ladder repairs

The WRFT Biologist (in his own time) together with other volunteers carried out repairs to this fish ladder in 2002 and 2003, sufficient to enable salmon to ascend to Loch a' Bhaid-luachraich. Subsequently, Scottish Water installed a fish pass to enable salmon and sea trout to enter the loch through the dam.

In 2005, juvenile salmon were found in sections of the river above the fish ladder, and in 2007, just below the dam. However, one remaining problem is that the lower pools of the fish ladder are leaky. At low flows water percolates through the walls of the pools, and fails to reach the bottom of the ladder. Any juvenile salmon or sea trout heading downstream at low flows are in danger of becoming stranded.

The costing here is for half a day of WRFT biologist time to prepare a project proposal and organise further repairs to the ladder.

Group 10 **Improve fish habitat and productivity**

10a Upper Gruinard river catchment area

At the WRFT Ecosystem fertility seminar on 29th November 2007 in Gairloch, the Abhainn Strath na Sealga catchment area was highlighted as one where the productivity of habitats and the ecosystem had declined over many years. Some of the problem areas were outlined in the WRFT Gruinard River FMP (Butler 2001)

Discussions are currently ongoing regarding the development of project(s) to enhance the productivity of habitats within the catchment for wildlife and juvenile fish production.

The costing is for a further two days of WRFT Biologist time to contact owners, and seek views regarding an outline proposal.

10b Rhidorroch River

This is the principle spawning tributary for salmon in the Ullapool River system and is naturally unstable. Complex problems were described in detail in the WRFT Ullapool River FMP (Cunningham, 2006). Possible actions proposed in the plan included riparian woodland projects above the accessible area for fish in Glen Douchary headwater areas; to progress any actions requires collaborations of several estates who share ownership of this part of the catchment.

The costing is for an initial two days of WRFT Biologist time to contact owners, and seek views regarding any possible actions.

10c Loch Maree spawning burns

Until the early 1990s, spawning burns around Loch Maree were cleared of blockages periodically by Loch Maree Hotel ghilliies to enable sea trout to access gravel areas.

The Loch na Fideil burn is potentially the most important sea trout spawning burn along the southern shore of the loch. However spawning areas are weeded up following poaching of river banks by cattle and input of large amounts of silt. The site was inspected by Dr Martin O'Grady (Central Fisheries Board of Ireland) in ?2003 who recommended that action be taken, including desilting of the streambed.

In 2006, a project proposal was developed with the support of John Parrott of Scottish Native Woods to fence off river banks from cattle to protect the stream. This project was shelved after the closure of the Scottish Woodland / Forestry Grant Scheme in 2007 were terminated in spring 2007. Full support of all stakeholders has yet to be reached.

The costing presented is for an initial 2 days of WRFT biologist time to develop, agree and submit a proposal.

10d Tollie Burn habitat restoration.

Part or all of the Tollie burn has in the past (until a few hundred years ago) flowed past Tollie Farm into Loch Maree at Tollie Bay. The old stream channel can be clearly seen, indicating that a substantial volume of water went this way. Local anecdote indicates that the burn was diverted some 2 or 3 hundred years ago into its present course over two steep cascade section into the River Ewe, to power mills, ruins of which can still be seen.

There is much local interest for a project to restore part of the flow into its former channel. By doing so, fish access into the system would be improved and large areas of spawning habitat for sea trout and

salmon would be restored. There is a population of freshwater pearl mussels in the river, densities of which are highest in a low gradient section above the bifurcation. An extensive area of similar habitat could be recreated below Tollie farm.

This is potentially an exciting, high profile project involving several collaborative project partners, which will benefit wild salmon, sea trout fisheries of Loch Maree, Freshwater pearl mussels, and to re-establish a rich wildlife corridor and wetland habitat.

The costing presented is for an initial 2 days of WRFT biologist's time to develop a proposal.

10e Strath Burn (Gairloch) fishery development project

The Strath burn (Abhainn a' Mhuilinn) by Gairloch formerly supported runs of sea trout and a few salmon according local anecdote (not all the fish were caught by rod and line. . . . !). Until 2007, a old boulder weir at the outflow of Linne a' Mhuilinn obstructed passage for sea trout and salmon moving attempting to enter and exit the loch. In summer 2007 the WRFT biologist, together with volunteers from Gairloch Angling Club opened up a fishway into the loch following meetings with SNH and SEPA representatives.

The main aim of this project is to find out whether a sea trout and salmon run becomes established through monitoring (trapping and electro-fishing survey). Some further small scale habitat improvements may be needed. Further discussions with the crofting grazing committee, the proprietor (Gairloch Estate) and the local angling club (who have fishing rights on one of the lochs in the system) will be required to develop the project further. There may be potential to establish a small sea trout fishery of value to the local community.

The costing presented is for an initial 2 days of WRFT biologist's time to develop a proposal.

10f Upper Bruachaig water abstraction review.

The Bruachaig re-stocking project is outlined elsewhere (12f). This proposal is for a review of water abstraction and diversion from the upper Bruachaig catchment into Loch Fannich. The WRFT biologist visited the abstraction area with Dr Alastair Stephen and Achie Green in April 2004. Further investigations, in context with new CAR regulations are proposed.

The costing presented is for an initial 2 days of WRFT biologist's time to develop a proposal.

The Scottish Rural Development Programme (SRDP) provides a mechanism for achieving proposed habitat restoration actions (see Box 6.1)

10g Survey and enhance Freshwater Pearl Mussel Populations

Wester Ross is a stronghold for the Freshwater pearl mussel (*Margaritifera margaritifera*). The relationship between FWPM and juvenile salmon and trout is considered by some to by a symbiotic one (e.g. Ziuganov et al, 1994). Much work, supported by SNH, has gone into studies of the FWPM populations in the River Kerry SAC for FWPM. However, FWPMs have not yet been surveyed in several major rivers within the WRFT area, including the Gruinard River and Little Gruinard River where there are large areas of potentially good, stable habitat for them. Further surveys are required to understand the distribution of FWPMs in the WRFT area and opportunities to restore and enhance FWPM populations as an integral part of healthy riverine ecosystems which support production of juvenile salmon and trout.

Group 11 **Fisheries Management Group meetings**

These meetings are intended for all those who are involved with fisheries management issues on specific rivers, such as stocking programmes and habitat management projects. The aims of meetings will be to review data collected by WRFT, report progress on specific actions (e.g. stocking programmes, habitat projects) and consider future recommendations. In some respects, meetings aim to parallel Area Management Group meetings for sea areas; they could also be seen as fisheries 'sub-board' meetings.

The following rivers are listed where ownership of the fisheries and the river banks are shared between more than one owner. For each of these rivers WRFT, an initial 5 year FMP has already been prepared describing the river, its fisheries and presenting recommendations for management.

The costing presented for each river is for an initial 1 days of WRFT biologists time per river to prepare a report and attend a meeting, except for the River Ewe where 2 days of WRFT time are scheduled, in view of the amount of monitoring work and project work that can be carried out.

11a Broom Fisheries Management group

11b Gruinard Fisheries Management group

11c Ewe & Loch Maree Fisheries Management group

11d Balgy

11e Carron

11f Glenmore & Glenbeag

Group 12 **Support stock restoration and supplementary stocking**

Salmon and sea trout stocking programmes are ongoing on many of the river systems listed. The WRFT Role is primarily to provide guidance and some practical help with catching broodfish, sorting them, scale reading (check for farm escapes) and stocking out fry. Note that the inclusion of a cost for the rivers listed does not mean that the need for any stocking each year is a foregone conclusion.

The decision to stock or not to stock will be based on a range of information, including rod catches, observations at spawning time (primarily by estate staff) and the results of electro-fishing surveys.

12a Kanaird

The costing presented is for an average of half a day of WRFT biologist's time per year.

12b Ullapool

The costing presented is for an average of half a day of WRFT biologist's time per year.

12c Broom

The costing presented is for an initial two days of WRFT biologist's time per year to develop a programme, pending interest and support of fishery proprietors (see WRFT River Broom FMP for further details).

12d Dundonnell

The costing presented is for an average of half a day of WRFT biologist's time per year.

12e Gruinard

The costing presented is for an average of 2 day of WRFT biologist's time per year.

12f Ewe and Loch Maree

The costing presented is for an average of 4 days of WRFT biologist's time and 6 days of estate staff time (presented as assistant biologist rate) per year – and is based on the on-going costs of the Bruachaig Restoration project which has been funded by TWG in 2006-7 and 2007-8.

12g Balgy

The costing presented is for an average of 2 days of WRFT biologist's time per year – this is very speculative and will depend on results of ongoing genetic studies by FRS and aspirations of fishery managers.

12h Carron

The stocking programme has been managed by Seafield College and funded separately with no involvement of WRFT. It is not foreseen that WRFT will be requested to play a role in this programme in the next five years.

12i Elchaig and Ling

The costing presented is for an average of one day of WRFT biologist's time per year.

12j Glenmore and Glenbeag Rivers

The WRFT biologist has recommended in fish survey reports drafted 2007 that a stocking programme be developed for both of these rivers, specifically to restock headwater areas with juvenile salmon.

The costing of two days of WRFT biologist's time per river in support of this programme is dependent upon support from local estates to establish the stocking programme.

Group 13 **Sea lice monitoring and management**

13a Post-smolt sea lice; Dundonnell & Poolewe

WRFT has long-term data sets for post-smolt sea lice monitoring in June for Dundonnell (fyke net) and Poolewe (gill net). The data sets show trends in numbers of captured fish which have returned early to freshwater vrs. effort, and changes in the prevalence, intensity and abundance of sea lice infection from year to year on fish captured. If sweep netting can contribute similar data (perhaps with additional sweeps in June) then I'd consider discontinuing our traditional sampling, though would like to discuss with colleagues. A sea lice minitoring review meeting is scheduled for early November 2008 to which fisheries trust biologists have been invited.

The costing presented assumes that the traditional sea lice monitoring programme may recommence in June 2009 at Poolewe and Dundonnell and is based on the bid to Scottish Government in December 2007. Note that this is by no means certain. Figures have been rounded.

13b Sea trout sweep netting

We are currently assessing the suitability of sites for sweep netting in sea lochs within the WRFT area, and envisage finding 5 or 6 suitable sites within the WRFT area as follows:

1. Loch Broom – Little Loch Broom area
2. Mouth of Gruinard River
3. Loch Ewe
4. Loch Gairloch (this site is outwith an AMA or proposed AMA area)
5. Mouth of River Carron
6. Loch Long (by Loch Duich)

To do this work we will need to purchase a sweep net (currently we have one on loan from WSFT), we may need to purchase a small boat and trailer to set the net, fit a tow bar to the trust vehicle, put biologist / operator through a small boat handling course, we will need to buy new sets of waders and wet suit / dry suit for snorkeling (at some sites it may be useful to watch the lead line), some training may be involved to meet health and safety requirements for snorkelers?

We'd propose to aim to sweep net each site once per month throughout the year at some of the sites (though in practice this may mean about 8 to 10 sweeps at any location per year) according to guidance from the TWG / RDOs.

The costing presented is based on the bid for AMA support submitted to Scottish Government in December 2007. Figures have been rounded.

13c Rod and line

This can be undertaken to supplement other information when an epizootic may be occurring (additional sampling is undertaken when an angler reports catching two or more sea trout with more than 30 lice per fish). The value of rod and line sampling is that samples of early-returned fish can often be obtained quickly and at relatively little expense to assess the severity of a lice epizootic where large numbers of early returned fish are present.

At the most basic level, angler's catches can be inspected. These samples are not representative of the whole sea trout population (sweep net samples from locations away from a river mouth are not representative either). If the fish have early stage sea lice (e.g. small chalimus) on them and have therefore been recently infected it is possible to learn about the continuation of infection pressures in nearby waters.

The cost presented is for an average of two WRFT Biologist days per year; this will vary according to the occurrence of lice epizootics.

13d AMA Sea lice Management

The WRFT Biologist is not a member of the Loch Ewe AMG, Loch Torridon AMG and Loch Alsh Duich AMG for reasons perhaps best known to Marine Harvest. If a primary purpose of AMGs is informed discussion to establish management requirements it might prove to be constructive and helpful for the health of wild fisheries if he were to participate in all AMGs within the WRFT area.

There may be occasions where the WRFT biologist would strongly recommend additional lice treatments to protect important wild fish stocks if details of on-farm lice levels were known to him. Clearly this could have financial implications for Marine Harvest.

The cost here is for the WRFT biologist to report sea lice data and to attend AMG meetings where data can be discussed and any implications for sea lice management agreed.

13e Salmon farm sea lice monitoring

There is a need to ensure that sea lice levels on farm salmon are continuously monitored and actions taken when needed to safeguard wild fish in surrounding waters, whether an AMA is in place or not. To understand relationships between lice levels on salmon farms and on wild fish in surrounding waters, data from both wild and farmed fish should be available for analyses by independent scientists. Because of fears that fish farm sea lice data could be published under freedom of information legislation, FRS Fish Health Inspectors only 'audit' sea lice data collected by fish health inspectors, no lice data is collected or held by FRS. In such a way, a salmon farm with lice levels that cause damage to wild fish in surrounding waters is effectively supported by state-sanctioned protection from litigation even when ; the wild fish and the fisheries they support are of secondary concern. In such a way, the Scottish Government ensures that information that might lead to legitimate legal challenges from wild fisheries interests (and is therefore 'commercially sensitive' to the salmon farming industry) does not become publically available. This is clearly not a state of affairs that WRFT should support.

Group 14 **Monitoring of marine environment and fishes**

14a Seal management meeting Loch Alsh

There are opportunities to further develop seal monitoring and seal management (if required) programmes within AMA areas, in collaboration with fish farmers, the Sea Mammal Research Unit (SMRU) and wildlife tourism interests. This can help to strengthen the AMA process at the local level.

WRFT hosted a seal management training workshop in 2005 organised by the WRASF Board in collaboration with SMRU. WRFT also developed a seal monitoring project at Kyle Rhea in collaboration with the Sea Mammal Research Unit of St Andrew's University (2004 and 2005).

To take a lead on coordinated seal management, WRFT would seek, as an initial step, funding from TWG to organise a meeting(s) in a selected AMA areas to which all potential stakeholders would be invited including SMRU. The Lochalsh – Duich AMG have expressed an interest in learning more about local seal populations. WRFT previously carried out seal monitoring project as part of the NW Region AMA Implementation Programme at Kyle Rhea (within the Loch Alsh AMA area) as part of the HIE funding programme. WRFT would be keen to collaborate with any other groups

The costing presented here is for an initial meeting in the Loch Alsh AMG area.

14b Sea life monitoring

There is much interest from anglers, fisheries proprietors, fish farmers, wildlife enthusiasts, wildlife tour boat operators, bird conservation agencies and a wide spectrum of other individuals and groups in the health of the inshore marine environment, particularly the seasonal occurrence of 'bait fish': food for sea trout, sea birds, cetaceans and other wildlife.

The WSFT has operated a useful project using benthic trawls to contrast food availability for sea trout in two sea lochs. Wester Ross Fisheries (formerly Wester Ross Salmon) has compiled observations of fishes and other wildlife seen from fish farms in Loch Broom over the past two years, providing an interesting record of observations from surface waters (including jellyfish observations). FRS Marine Lab periodically carries out inshore fisheries surveys within surrounding waters, though results are not always readily available to local interested groups. In early summer 2007, large shoals of sprats & juvenile herrings were reported in many local sea lochs, and sampled in Loch Gairloch by the WRFT biologist (sample contained juv. herring). The shoal in Loch Gairloch provided food for terns, mackerel and probably sea trout through June and much of July and could be observed from the pier and by snorkeling (in WRFT biologist's own time!). Similar shoals were reported from Little Loch Broom and Loch Torridon.

AMGs may be ideally placed to collect, collate and provide up-to-date reports of records of 'bait fish', jelly-fish blooms and other biota of interest to wild fisheries interests and the wider public. There may be useful PR value in being able to provide regular reports of marine wildlife via AMGs within local communities.

WRFT would seek funding to set up and extend a participatory marine wildlife monitoring system initially to exchange observations from a range of local sources primarily for publication in local media (radio, newspapers, website). WRFT would also seek to collate and compile any more quantitative data (e.g. occurrence of non-target fish and shellfish in sweep net samples) that might help to further an understanding of inshore productivity and food availability for sea trout and other wildlife. WRFT would seek to collaborate with other agencies to develop more rigorous monitoring protocols.
The costing here is for 5 days of WRFT Biologists time to extend the recording system (based on the current WRF scheme) to other observers, and to compile records and a prepare a report at the end of each year.

14c Sea bass monitoring

Local anglers have reported catching 'schoolie' sea bass around the Wester Ross coast in recent years. In Sutherland, salmon & sea trout anglers go fly fishing for bass in the Dionard estuary when the river is out of condition. This project is to set up a catch monitoring scheme so that basic data (length, weight, scale samples) are collected. Protocols developed by CEFAS & promoted by Bass Anglers Sportfishing Society will be adopted.

The costing here is for two days of WRFT biologist time to set up and promote recording scheme and collate records and prepare a report.

14d Pollack monitoring scheme

Pollack are common around the coasts and fish of up to 10lb have been taken by shore anglers in recent years. Pollack take sea trout. Levels of predation are unknown. There is little information on Pollack abundance and diet in the area. This project is to set up a catch monitoring scheme with local anglers so that basic data (length, weight, stomach contents) are collected.

The costing here is for two days of WRFT biologist time to set up and promote a recording scheme and to collate records and prepare a report.

14e Melvaig herring spawning survey

Herring spawn on firm stony substrate, sometimes quite close inshore. Within the WRFT area, herring formerly supported a commercial fishery, upon which the town of Ullapool was founded. The herring fishing crashed in the late 1970s. Until then much of the fishing had been done by relatively small locally based boats. Local fishermen had detailed knowledge of fishing and spawning grounds and of different stocks of fish in the area.

Juvenile herring are an important souce of food for sea trout and many sea birds. Larger fish provide food for gannets, porpoises and Minke whales. Gairloch is one of the leading tourist centres for marine wildlife tourism.

The Minch Review (Amanda Brian 1994) describes a spawning area for herring to the west of Melvaig. In May 2007, four Minke whales were observed feeding in the area; in late September 2007 one Minke whale, porpoises and many (150+) gannets were feeding in the area.

This project aims to find out, in collaboration with local fishermen and wildlife tour boat operators, whether the area is still used as a spawning ground by herring, and to collect information about the timing and status of herring in the area.

The costing here is for two days of WRFT biologist time to set up and promote a recording scheme and to collate records and prepare a report.

14f Rays and skate

Wester Ross was formerly a leading venue for sea angling. During the 1970s, the World Sea Angling championships were held in Ullapool.

More recently, large Common skate and Thornback rays were taken by sea angling charter boats from Gairloch. Stocks are said to have collapsed in the area, although in the trawler exclusion zone around Loch Torridon, large skate may still be present. The Common skate is listed on the IUCN Red list as 'Critically endangered'.

None of the government agencies appear to be paying much attention to the conservation status of these fish species in local waters. To fill a void in data collection, and to generate the local interest and concern for the conservation and management of these fishes, WRFT proposes to facilitate a recording scheme with other businesses / organisations.

This project aims to find out more about the status of skate and ray populations in the area, in collaboration with local commercial fishermen and sea angling boat operators.

The costing here is for an initial two days of WRFT biologist time to set up and promote a recording scheme and to collate records and prepare a report.

Group 15 **Fisheries Protection**

15a Fisheries Development Officer

The primary role of a fisheries development officer would be to act as a link with anglers, providing information about fishing (e.g. need for returning trout to some lochs, but OK to take large baskets from others), guidance (e.g. minimizing disturbance to other wildlife) and collating catch records (assessing the quality of different waters from year to year. There are six angling clubs in the WRFT area (Ullapool, Poolewe, Gairloch, Kinlochewe, Shieldaig, Lochcarron and Glenelg). Several hotels offer fishing for guests and visitors. However, catch details are hard to come by.

The need and remit of an FDO has yet to be agreed by all parties. A full time FDO is employed by Western Isles Fisheries Trust, for the WRFT area a part-time FDO with a similar remit might be appropriate.

An initial step would be to develop a more detailed outline of what an FDO could do and how such a posting would be costed, then to seek support from all stakeholders.

The initial costing is for one day of WRFT Biologist time to develop the proposal. Possibly collaborating agencies would be The Highland Council countryside ranger service or SNH.

15b Fisheries protection

Anecdotal reports suggest that levels of illegal netting of salmon in some areas may have increased following the cessation of operations at legal netting stations. At present areas around the major salmon rivers are patrolled and protected by estate keepers. However, with other duties to attend to (assisting guests) estate keepers are not always able to keep a check on what is going on. There are large areas of the coastline away from river mouths where illegal nets may be set. The Scottish Fisheries Protection Agency also carries out patrols.

Some crofters may still take the view that they have the right to one or two fish each year. Of more concern would be netting of salmon on a commercial scale for markets out with the area.

The initial costing is for one day of WRFT Biologist time to develop the proposal. Possible collaborating agencies would be The Highland Council countryside ranger service or SNH.

Group 16 **Education**

16a Salmon / trout in the classroom

WRFT launched this project in 2004 and since then ran it at 15 primary schools between then and 2006. In 2008 the project will run at Poolewe PS. As elsewhere in Scotland, the project has fitted into the school curriculum well and has been much appreciated by both teachers and pupils.

Local primary schools have small, mixed-age classes; the initial proposal was to rerun the project every three or four years at the same schools so that all children are able to experience the project.

The costing here was based on a budget of £1,000 per school (assistant biologist rates) to set up and run the project and arrange to field trips (electro-fishing team rate) to release fish into a local stream, then revisit the stream later in the year to find out how fast the fish are growing.

PS: Please note that this project has been recosted and is scheduled to run in 2009 in 4 primary schools with grant funding from SNH and the Scottish Government via RAFTS.

16b Life in Lochs and Lochans

This project was developed in 2006 and again in 2007 in collaboration with primary schools in the south of the area. The project is designed to complement the Salmon and Trout in the Classroom project (16a), and introduces children to the wonderful diversity of wildlife in lochs and lochans. Most primary schools in the area are located only a short distance from a freshwater loch.

The costing here is based on a budget of £1,000 per school (electro-fishing team rates) to run the project with a field trip to sample aquatic life at nearby lochs and classroom session with the school teacher.

16c Student projects

Lots of possibilities here requiring further development and discussion. Currently a Phd student is assisting with the Loch Maree Wild Trout Project, based at Middlesex University (links to University of Highlands and Islands).

The costing here is for a total of one day of WRFT biologist's time each year to consider potential student projects.

16d Work experience placements

Local schools often approach WRFT to find out whether the trust is able to offer work experience placements. The WRFT Biologist was processed by Central Registered Body in Scotland (CRBS) and became a lead signatory for the organisation. WRFT will consult with teachers and CRBS prior to agreeing to accept any school pupil on a work experience placement.

The costing here is for a total of one day of WRFT biologist's time each year to consider potential student projects.

16e WRFT Loch Maree Family Day

This event takes place in October each year and has been supported by The Highland Council countryside ranger, SNH and FRS. The day provides hands-on opportunities for adults and children to find about freshwater fishes and other wildlife of the area, and about the work of the trust. The cost is based on expenses for organising and running activities in 2007.

Group 17 **Extending awareness of wild fishes and fisheries management needs in WRFT area**

17a Newsletter and Annual Review

WRFT has produced two newsletters and an annual review each year. These are sent to around 300 recipients, including WRFT members, river proprietors, estate staff and government agencies.

Costs presented for these include total preparation time (10 days at Biologist's rate) and printing.

17b Web site

The development of a website is now considered to be of high priority for the Trust.

The cost presented is for setting up the website and updating it.

17c Leaflets and angler information

Many anglers return to Wester Ross year after year to fish. Some have invested as Life Members of WRFT, and it is crucially important that they and other anglers are kept up to date with fisheries management activities that are taking place within the systems that they fish, especially on days when fish are hard to catch!

Catch and release is now practiced on nearly all rivers. In 2004, WRFT launched the 'Wild Trout Project' Anglers log book scheme. This scheme generates catch per unit effort data.

In 2008 the Trust may try to extend a similar recording scheme to salmon and sea trout fisheries to standardise the collection of fish catch data.

The cost presented here is for an average of one day per year to prepare materials and for printing a small quantity of leaflets.

17d Poster, T-shirt & booklets

In 2004 WRFT published the Loch Maree poster, depicting fisheries and wildlife of the loch. Illustrated by Robin Ade, the poster aims to highlight links between salmon, trout and other fish and other animals. Wester Ross has some very special rivers and lochs. The poster stresses the need to restore the productivity of both freshwaters and coastal seas. The poster was supported by RACE, SNH, The Highland Council, and local hotel proprietors. 100 copies were given to the HC education department at Dingwall for distribution to schools in the Highlands. Other copies have been sold at local outlets.

Proceeds from sales are to be reinvested in production of other information / awareness related item. At present there are a range of options for spending this money.

17e Loch Maree Fisheries and Wildlife Interpretation Centre

This has been talked about off and on for several years. Loch Maree is the largest and most important freshwater loch in the WRFT area for fisheries and wildlife.

The proposed centre would be seasonal, and act as an information / contact pint for visitors coming to the area to fish, see wildlife, or launch a boat of the loch. The centre could be a base for a Loch Maree 'warden' / Fisheries Development Officer, and also provide interpretative materials describing the loch, its fish and wildlife and fisheries (including the development of dapping).

The centre would be developed as a collaborative venture with FC, SNH, perhaps local estates and the Loch Maree Hotel.

An initial 2 days of WRFT biologists time has been costed in.

Group 18 **Training requirements**

18a Electro-fishing training

The costing is for one person to attend an electro-fishing training course each year on average to ensure that there is a pool of appropriately qualified people in the area to provide field assistance. Costs are set out in 1a.

18b Boat handling training

The cost of this is to train the WRFT biologist so that he is qualified to operate boats as part of his work.

18c Computer skills revision

Both the WRFT biologist and the administrator spend much of their time working at a computer. Both are largely self-taught; the proposal here is to spend a day reviewing and learning new skills to increase efficiency.

Group 19 **Review progress**

19a Review and update fishery management plan

Many of the actions listed above are aspirations for the next 5 years. The FMP will be constantly changing according to the results of monitoring and opportunities for funding, and progress from year to year.

The costing assumes that in total about 2 WRFT Biologist days per year towards reviewing and updating the FMP, including work programmes and discussions with Trustees.

6.3 Interaction with other water users, SNH and SEPA

Two WRFT trustees are members of the Wester Ross Area Salmon Fishery Board. One of the trustees is a representative of fish farming industry in the area. There is currently a vacancy for an Angling Club representative. A local SNH Officer is invited to attend WRFT Trustee meetings. WRFT Trustee, John Mackenzie sits on the local Area Advisory Group, which exchanges information with SEPA regarding CAR guidelines. Several meetings have been held with WRFT Biologist & SEPA (Rachel Harding-Hill and team) to discuss overlap with River Basin Management plan

For specific actions listed above, the WRFT biologist's communicates directly with SEPA, FRS, SNH for concerns (Habitats Directive legislation, SSSI's) and Scottish Water.

WRFT Biologist informs all landowners or the estate keeper prior to carrying out any work in the field. Very often field surveys are discussed over a cup of tea prior to the survey, and / or reported over a cup of tea at the end of the day. Where the keeper or proprietor is able to join the survey team, the results of surveys and consequent management requirements can be discussed on site.

Following preparation of fisheries management plans, subsequent results of field surveys are reported in fisheries management reports, usually prepared during the winter following field surveys.

6.4 Assessment of effects of specified solutions

Detailed costings for specific actions will include, where appropriate baseline surveys (if these have not already been undertaken) and subsequent follow up monitoring to record any changes in fish populations or other wildlife as a result of actions that have carried out.

In previous occasions, e-fishing teams have targeted areas where actions have taken place (e.g. stocking) to assess progress of stocked fish. To date assessing long-term changes in fish populations as a result of habitat manipulation has been more difficult – though some sites where e.g. riparian woodland enclosures have been established have been monitored before and after actions taken place.

In many instances, WRFT would seek specific guidance from FRS if a treatment-control type experiment was considered necessary. In some occasions, where the costs of monitoring were disproportionately high relative to the costs of the action, WRFT would also seek guidance as to the level of monitoring necessary.

6.5 Cost-benefit analyses

Table 6.5.1 presents a cost-benefit analyses for proposed actions. The costs of some of these actions are based on over-headed rates at the time of writing [march 2008] for example, costs of an electro-fishing survey or WRFT biologist work day. These costs are subject to on-going review.

Benefits are less easily measured, especially for surveys. If a survey provides clear evidence of a problem then the survey can be valued according to subsequent improvements in the productivity of a fishery when an appropriate action is taken. However, if problems are not identified, and the fish population / habitat is considered to be healthy, that does not mean that the survey is of little value!

The table is therefore subjective, but attempts to relative measures of the benefit of different approaches to data collection. For example, timed-electro-fishing survey is considered to be of higher benefit relative to the cost than fully quantitative electro-fishing survey. Like wise, when almost nothing is known about fish populations in a loch and inventory gill net survey might be considered to provide good value for information obtained relative to a hydro-acoustic survey which fails to correctly identify fish to species level.

Acronyms used in the table are as follows:

AST	Atlantic Salmon Trust
EU	European Union
LTCS	Landfil Tax Credit Scheme
NERC	Natural Environment Research Council
RAFTS	River and Fishery Trusts Scotland
SEPA	Scottish Environment Protection Agency
SG	Scottish Government
SNH	Scottish Natural Heritage
FRS	SG Fisheries Research Services
SRDP	SG Scottish Rural Development Programme
TWG	SG Tripartite Working Group
HC	The Highland Council
WRASFB	Wester Ross Area Salmon Fishery Board
WRFT	Wester Ross Fisheries Trust

6.6 Potential funding sources

These are also shown against respective actions in Table 6.6.1. Core income is received from the WRASFB and proprietors of rivers outwith the board area, from fish farm companies, membership and some charitable trusts. In previous years funding has been received from SNH, HC, local enterprise companies and various other grant providers for projects.

It is anticipated that an increasing proportion of action funding will come from SG in future years, via RAFTS or TWG. At the time of writing actual amounts are unknown.

Table 6.6.1 *Cost-benefit analyses*

Cost-benefit analyses					
	Actions	**Cost**	**Benefit**	**Comment**	**Potential Funder**
1	**River fish survey**				
1a	Timed e-fish survey	High	High	Informs salmon management at local level	Core
1b	Quantitative e-fish survey	Very High	Medium	Provides data for national purposes	Core to date
1c	Spawning salmon survey & redd counts	High	Medium	Locally useful	Core and project (in past SNH for R. Kerry)
1d	Snorkel survey - juvenile fish	Medium	Medium	Very site specific	Core
1e	Snorkel survey - adult fish	High	Medium	Locally useful	Core and project (in past SNH for R. Kerry)
1f	Lamprey monitoring	High	High	Informs lamprey conservation	SNH
2	**Loch fish & fisheries survey**				
2a	Inventory gill netting	High	High	Especially high where very little is known	?SNH - may be subcontracted
2b	Hydro-acoustic survey	Very High	Medium	Of little value unless gill netting also undertaken	FRS - sub-contracted
2c	Arctic charr spawning sites survey	High	High	Crucial for charr conservation management	?SNH - collaborative survey
2d	Rod catch analyses (including Angler's log book)	Medium	High	Can be most useful info source if no other.	?Core / local angling clubs
3	**Fish populations**				
3a	Tournaig project	Medium	High	For a trap project, Tournaig has been good value	?TWG
3b	Rotary screw trap	Very High	High	Value high if for Loch Maree - Ewe sea trout	?TWG
3c	FRS Shieldaig trap project	Medium	High	Note that costing is just for WRFT biologist visits!	Core
4	**Genetic studies**				
4a	Loch Maree Wild Trout Project	High	High	Analyses is v. expensive but costed elsewhere!	Core / FRS / Wild Trout Trust / other
4b	Salmon population structuring	High	High	Analyses is v. expensive but costed elsewhere!	Core / FRS / EU / other
4c	Arctic charr population structuring	High	High	Costing is just for WRFT biologist assistance	Some external support appreciated
5	**Fish habitat survey**				
5a	River habitat baseline survey	High	Med-High	Law of diminshing returns applies.	LTCS to date / Core
5b	Loch habitat baseline surveys	Medium	Med-High	Law of diminshing returns applies.	?SNH / SEPA
6	**Riparian wildlife survey**				
6a	Survey riparian vegetation and fauna	Low	Medium	Data recorded during other field work.	Core
7	**7. Invertebrate survey**				
7a	Baseline survey - (? Little Gruinard)	Medium	Medium	Proposed as a student project	University / NERC
8	**Fisheries management research**				
8a	Stream nutrient enhancement trial	High	?High	Still to be fully discussed	Collaborative with ?in - kind support from estates & FRS
8b	Boulder placement - Rhidorroch River	medium	medium	Concept Still to be fully discussed	Collaborative with ?in - kind support from estates & FRS

Table 6.6.1 *Cost-benefit analyses* (continued)

	Actions	Cost	Benefit	Comment	Potential Funder
9	**Remove obstructions**				
9a	River Sguod bridge culvert	Medium	Med-high	In breach of CAR. Improve access for sea trout.	?HC as owners of culvert.
9b	2nd Coast road culvert	High	High	In breach of CAR. Access for sea trout and salmon	?HC as owners of culvert.
9c	Docherty burn culvert and spawning channel	Medium	Medium	In breach of CAR. Create sea trout spawning habitat.	?HC as owners of culvert.
9d	Water intake weir, Strath burn	Low	Low	In breach of CAR. Access for sea trout	?HC as owners of culvert.
9e	Kerry culvert repairs	Low	Low	In breach of CAR. Access for sea trout and salmon	?HC as owners of culvert.
9f	Slaggan burn	Low	Low	In breach of CAR. Access for sea trout	Local estate / volunteers
9g	Allt beith fish ladder project	Medium	Medium	Fish ladder is leaky.	?Funding to source ?WREN
10	**Improve productivity of fish habitat**			Benefits for other wildlife	
10a	Upper Gruinard catchment	High	High	Remote area with access problems.	SRDP in collaboration with estates
10b	Rhidorroch River upper catchment	High	High	Remote area with access problems.	SRDP in collaboration with estates
10c	Loch Maree spawning burns	Med-high	Med-high	Various places	SRDP, estates, SNH, volunteers
10d	Tollie Burn habitat restoration	High	High	For Loch Maree sea trout	SRDP in collaboration with estates
10e	Strath burn fishery development project	High	High	For local sea trout and amenity	SRDP, Angling Club, local businesses
10f	Upper Bruachaig - water abstraction review	Med	Med-high	For salmon population potentailly high	TWG / local estates / other
10g	Enhance FPM populations	High	Medium	but high benefits for freshwater pearl mussels!	SNH / Charitable trust?
11	**Fisheries management meetings**				
11a	Broom	Low	Medium	Good value if restoration programmes catalised	Core / estates
11b	Gruinard	Low	Medium	Good value if restoration programmes catalised	Core / estates
11c	River Ewe	Low	Medium	Good value if restoration programmes catalised	Core / estates / TWG
11d	Balgy	Low	Medium	Good value if restoration programmes catalised	Core / estates / TWG
11e	(?Carron)	Low	Medium	Good value if restoration programmes catalised	Core / estates / TWG
11f	Glenmore & Glenelg (?hatchery)	Low	Medium	Good value if restoration programmes catalised	Core / estates / TWG
12	**Restoration and stocking programmes**			Law of diminishing returns probably applies!	
12a	Kanaird	Medium	Medium	Redd washout may be a problem in some years	Core / other (SG)
12b	Ullapool	Medium	Med-High	Redd washout may be a problem in some years	Core / other (SG)
12c	Broom	Medium	Medium	Aim to target ditches & channels around fields	Core / other (SG)
12d	Dundonnell	Medium	Medium	Redd washout may be a problem in some years	Core / other (SG)
12e	Gruinard	Medium	Med-high	Wild fish absent from headwaters	Core / other (SG)
12f	Ewe & Loch Maree	High	Med-high	Wild fish absent from headwaters	Core / other (SG)
12g	Balgy	Medium	Med-high	Further info needed about genetic status of salmon	Core / other (SG)
12h	Carron	?V High	?High	Contribution of stocking (vs natural recovery) not known	River Carron proprietors & others?
12i	Elchaig and Ling	High	Medium	Elchaig may benefit	Core / TWG / other (SG)
12j	Glenmore and Glenbeag (Glenelg)	High	High	Wild fish absent from headwaters	Core / TWG / other (SG)

Table 6.6.1 *Cost-benefit analyses* (continued)

	Actions	Cost	Benefit	Comment	Potential Funder
13	**Sea lice monitoring and AMAs**				
13a	Post-smolt sea lice : Dundonnel & Poolewe	Medium	High	Exposes problems efficiently	TWG
13b	Sea trout sweep netting	High	High	Added value from records of other fish species	TWG
13c	Rod and line sea trout sampling	Low	High	Inexpensive way to assess severity of epizootic	TWG
13d	Area Management Groups	High	?	Long-term value (to wild fish) still to be demonstrated	TWG
14	**Monitor marine ecosystem . . .**				
14a	Seal monitoring & management groups	Low-Med	?High	Projects still to develop	?TWG
14b	Sea life monitoring(collaborative project . . .)	Low-Med	Med-high	Projects still to develop	?TWG
14c	Sea bass monitoring (collaborative project . . .)	Low-Med	Med-high	Projects still to develop	Unknown
14d	Pollack monitoring (collaborative project . . .)	Low-Med	Med-high	Projects still to develop	Unknown
14e	Herrings (collaborative project . . .)	Low-Med	Med-high	Projects still to develop	Unknown
14f	Rays and Skate - monitoring (collaboarive)	Low-Med	Med-high	Projects still to develop	Unknown
15	**Fisheries monitoring and development**				
2d	Rod catch analyses (including Angler's log book)	Medium	High	Can be most useful info source if no other.	?Core / local angling clubs
15a	Fisheries Development Officer	High	Med-High	Project to develop	Tourism related businesses/ other
15b	Fisheries Protection	High	Med-High	Project to develop	WRASFB / other
16	**Education**				
16a	Salmon in the classroom	Medium	High	benefit rated high - children enjoy and learn much	core / SNH / HC
16b	Life in lochs and lochans	Medium	High	benefit rated high - children enjoy and learn much	core / SNH / HC
16c	Student projects	varies	varies	potentially very beneficial relative to cost	universities
16d	Work experience placements	Medium	Low-med	aim is to help the student rather than the fish	core
16e	Loch Maree Open Day	Medium	High	helps extend awareness of fish & fisheries	core & in-kind support
17	**Awareness**				
17a	Newsletter and Annual Review	Medium	High		core
17b	Web site	Medium	High	may be on line before you know it!!	?SNH
17c	Leaflets and angler info	Medium	low-med		various
17d	Poster, T-shirt & booklets	Low	Medium	and mugs. We've got a fine LMWild Trout Pr logo	various including project sponsors
17e	Loch Maree Fisheries & Wildlife Interpretation Centre	Very High	High	also benefits for local tourism businesses	Local tourism businesses / SNH / WRASFB
18	**Training**				
18a	Electro-fishing training	Medium	High	Staff need skills to work effectively	core / local enterprise company
18b	Boat handling training	Medium	High	Staff need skills to work effectively	core / local enterprise company
18c	Computer skills update	Medium	High	Staff need skills to work effectively	core / local enterprise company
19	**Review fisheries management**				
19a	Review and update fishery management plan	Medium	High	An on-going process to update priorities	core

6.7 Future planning cycles

Some of the actions which will form the first phase of the work programme are still awaiting the outcome of funding bids or have to be fully worked up into detailed fully-costed actions, this is very much a hypothetical section. It is therefore not possible to say very much about how future planning cycles will incorporate monitoring and assessment of the fist phase of actions.

Each year the WRFT reviews the work programme of the previous year. Much of the work programme is monitoring rather than actions to address specific problems. Monitoring requirements are subject to review by Trustees, peers (e.g. other biologists, AST biologist) funders (e.g. TWG), Area Management Groups, and pre-agreed as far as possible with river and fishery proprietors.

The first generation of WRFT FMP's presented recommendations for 'five year programmes', in practice much changes from year to year (including fish populations). It is pragmatic to be as flexible as possible so far as planning is concerned from year to year, and be able to alter work programmes as soon as possible following surveys, or as new opportunities for funding or project collaboration arise.

In summary, WRFT is rarely in a position to budget more than one year ahead for any of the activities that it carries out. Action plans are determined accordingly.