



Advisory Visit

St. Mary's Loch, Scottish Borders

18th August, 2010



Loch of the Lowes

1.0 Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to St. Mary's Loch, Scottish Borders, on 18th August, 2010. Comments in this report are based on observations on the day of the site visit and discussions with Richard Plisga and Alasdair White of St. Mary's Angling Club.

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left hand bank (LHB) or right hand bank (RHB) whilst looking downstream.

2.0 Catchment / Fishery Overview

St. Mary's Loch is located in the Scottish Borders approximately 30 km west of Selkirk, in the headwaters of the River Tweed catchment (Figure 1). The loch was formed during the last glacial maximum and is the source of Yarrow Water, a tributary of Ettrick Water. The loch is approximately 5 km long and 1 km wide and is managed by Scottish Water as reservoir with a dam and outlet at the eastern end.

Immediately upstream of St. Mary's Loch is the Loch of the Lowes, a smaller water body connected by a short length of river. A bathymetric map of the lochs is available on the National Library of Scotland website at <http://maps.nls.uk/bathymetric/view/?sid=74422324>. St. Mary's Loch is fed by Megget Water which flows down from Megget Reservoir, a 640-acre water supply reservoir serving Edinburgh. The 56-metre high, 568-metre long dam for Megget Reservoir was constructed between 1976 and 1983.

St. Mary's Loch and Loch of the Lowes are fished by St. Mary's Angling Club (<http://sites.google.com/site/stmarysloch/>). The lochs contain brown trout, pike, perch, eels and salmon which run up from Yarrow Water. Historically there was a population of Arctic char (*Salvelinus alpinus*) in the lochs but this was reputedly driven to extinction by netting of the spawning fish from the river between the lochs. St. Mary's AC is currently in the process of applying to Scottish Natural Heritage and the Tweed Commission to introduce char, something which has been carried out successfully at the nearby Megget and Talla Reservoirs (potential sources of fish for the re-introduction to St. Mary's).

St. Mary's AC was formed in 1933 as a trout fishing club. Pike were netted and removed from the lochs but this ceased in 1995 and pike angling is now popular within the club, with catch-and-release prevalent. Small numbers of trout were stocked into the lochs in the past, but this ceased when the Tweed system became a Special Area of Conservation in 2001 (www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0012691)

. The club are concerned about low catches of brown trout from the lochs, which are perceived to be worse than those in the past, and requested the advisory visit from the Wild Trout Trust to assess whether there was any scope for improving trout stocks through habitat improvements.

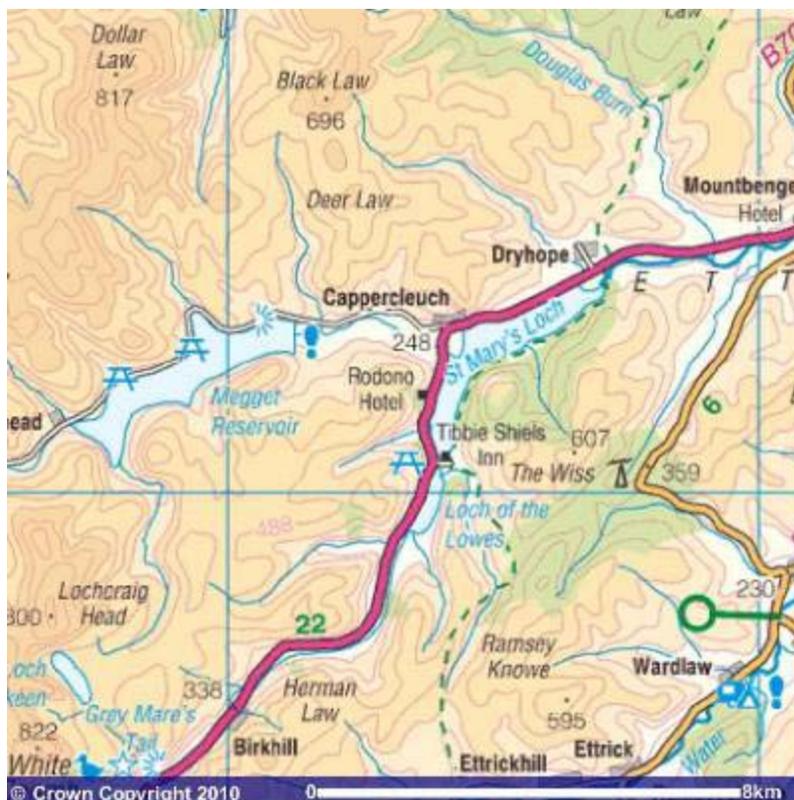


Figure 1 Location of St. Mary's Loch (see Appendices for more detailed maps). [Image produced from Ordnance Survey's Get-a-map service. Image reproduced with permission of Ordnance Survey and Ordnance Survey of Northern Ireland.]

3.0 Habitat Assessment

The outflow from St. Mary's Loch to Yarrow Water was inspected. This consisted of two concrete culvert spillways with flow control and gauging apparatus (Photos 1 - 3). Alongside these was a wider channel with a series of low weirs with sloping and dished crests (Photo 4); at the time of the visit there was no water flowing through this channel. Although the loch and river levels were low at the time of the visit, the arrangements for fish passage across the outflow appeared less than ideal. The water level in the loch at which this fish-pass channel works is known and it is therefore possible to work out how many days in a year the fish pass has water in. However there is also a large amount of gravel in the pass, reducing the depth of water in the pools and hence the passes effectiveness.

There are proposals to draw down the level of St. Mary's Loch to act as a buffer against flooding, which caused extensive damage in late 2009. This raises concerns regarding fish migration including accessibility to the loch for fish migrating to and from Yarrow water, and also access for trout and salmon into the spawning burns feeding the loch. If the latter are left perched above steep falls into the loch, or flowing across extensive shallow littoral areas then access could be severely compromised.



Photo 1 Outflow to Yarrow Water, looking downstream



Photo 2 As per Photo 1, looking upstream



Photo 3 Outfall arrangement at head of one of two concrete culverts (loch in background)



Photo 4 Channel with low weirs, not flowing at the time of the visit

A very important factor influencing the abundance of trout in the lochs is the condition of the numerous tributary burns which provide spawning and nursery habitat for trout and salmon. A number of these were inspected including the Kirkstead Burn, Summerhope Burn and Megget Water (St. Mary's tributaries) and the Little Yarrow, Chapelhope Burn and Crosscleuch Burn (Loch of the Lowes tributaries). Some trout fry surveys were carried out by the Tweed Foundation in 1998 and 2002 on burns in this locality and the results showed that at the majority of sites trout fry were absent or present in low (5 – 9 fry per 3-minute sample) or very low (1 – 4 fry per 3-minute sample) numbers.

Habitat quality in the feeder burns was generally quite poor, the common problems being over-wide, uniformly shallow channels with no defined thalweg (line of maximum depth within a channel). The main reason for this is grazing of the banks which restricts the diversity of vegetation along the burn margins and reduces their resistance to erosion; hence the banks are gradually pushed back leading to a wide, relatively featureless channel. In some cases the channels have been modified in an attempt to increase the flood conveyance capability or protect the banks from erosion; this has further damaged the in-stream habitat and reduced the capacity of the burns to produce trout. Photos 5 – 14 illustrate the factors affecting the habitat within and alongside the burns.

In contrast, the Little Yarrow has reasonably good habitat resulting from a habitat enhancement and protection project previously carried out by the Tweed Foundation. This burn has a good width of margin fenced from grazing and a diversity of vegetation has developed; the channel also tends to be relatively narrower and has a greater variety of depths (Photo 11)

The largest tributary of St. Mary's loch, and hence potentially the most important in terms of trout recruitment, is Megget Water. The construction of Megget Reservoir in the early 1980s drowned out a considerable amount of potential spawning and nursery habitat (the reservoir is approximately 4.25 km long). The Tweed Foundation has records describing the area before inundation as being used by numerous salmon and being an important spawning area. There is currently approximately 3.6 km of the lower river accessible to fish from St. Mary's Loch, but the influence of the reservoir upstream may also compromise the habitat quality in this section. There is no longer a source of sediment from the upstream catchment, hence the bed

load of the river will gradually be transported downstream without replenishment leading to a lack of suitably-sized gravels for trout and salmon spawning. The altered hydrology of the lower river as a result of regulated flows may also have impacts in terms of differences in temperature and oxygen concentrations compared with natural circumstances. Water chemistry data from the Tweed Foundation indicate the Meggat Water has very low levels of dissolved minerals (conductivities under 40 μS - very low for the Tweed catchment). Comparative data is given in Appendix 1.



Photo 5 Lower end of the Kirkstead Burn – an over-wide channel with little depth variation (no pools). The banks lack a variety of vegetation and there is no low overhead cover.



Photo 6 A little further upstream from Photo 5 (Kirkstead Burn). The channel bed has been scraped back against the outside of the bend, reducing the habitat quality of the channel still further.



Photo 7 Summerhope Burn – better in-stream habitat in the form of a narrower channel with more depth variation, but riparian vegetation could be improved by reducing grazing pressure.



Photo 8 Chapelhope Burn has recently been extensively modified, with the bed dug out and used to create embankments. Habitat here is very poor and will not produce or support much in the way of juvenile trout or salmon.

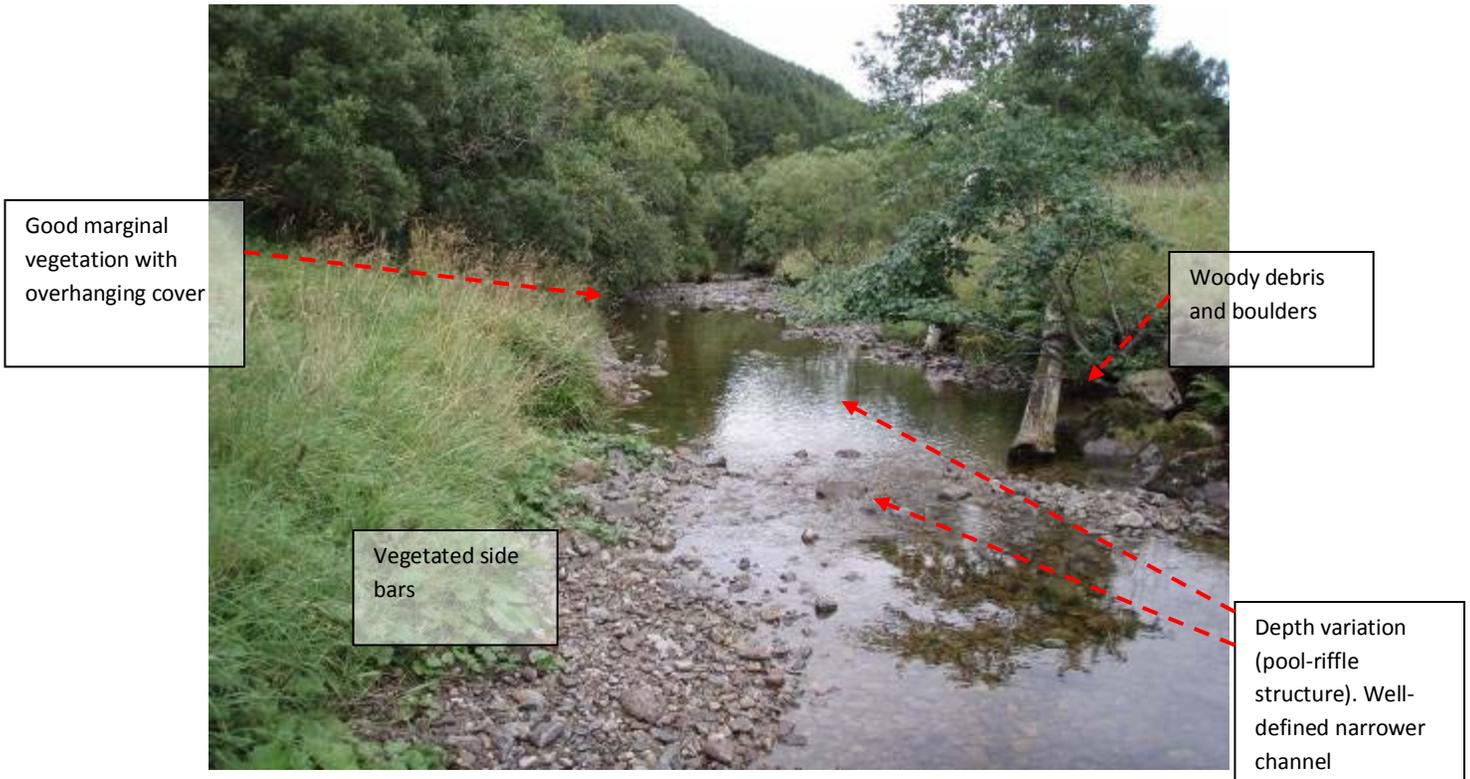


Photo 9 Chapelhope Burn just downstream of the section in Photo 8. Good habitat is present in this unmodified section.



Photo 10 Crosscleuch Burn. Overwide channel, modified to provide bank re-inforcement. Lack of depth variation and no pool structure.



Photo 11 Little Yarrow in the Tweed Foundation project section. Fenced margins have allowed a diversity of riparian vegetation to develop, the channel to narrow (as side bars vegetate) and a pool-riffle structure to develop. Overhanging marginal vegetation provides good low cover for juvenile trout and salmon.



Photo 12 Little Yarrow (looking downstream from same point as Photo 11). Good riparian vegetation, but the channel has a relatively uniform cross-section and could be improved.



Photo 13 Megget water just upstream of the main road bridge



Photo 14 Megget Water further upstream appears to have good riparian habitat (fenced) and reasonable in-stream habitat, although this was not closely inspected. The possible effects of the reservoir upstream on trout and salmon recruitment remain to be investigated.

4.0 Recommendations

The St. Mary's Loch outfall arrangements and their operation should be reviewed to assess their current impact upon migrating fish, and whether improvements can be made. Salmon currently run upstream from Yarrow Water, as shown by the presence of salmon parr in the lochs' tributaries. However, consideration should be given to the potential for other species to pass the outfall structure in both directions.

Local lore describes trout dropping downstream from St. Mary's Loch to spawn in the Yarrow and Douglas Burn. Whilst it is commonly assumed that salmonids run upstream to spawn, recent studies have shown that certain genetically distinct types of trout are outlet river spawners; the gillaroo trout of Lough Melvin and Lough Conn in Ireland being examples (Ferguson & Mason, 1981; Ferguson & Taggart, 1991; McKeown *et al.*, 2010). Given that outlet rivers have often been the subject of modification (as in this case) and that the young offspring of outlet river spawners have to make their way back upstream to the lough/loch, this group is particularly vulnerable to disruption.

Information from the Tweed Foundation suggests that prior to the modification of the loch outlet (for water supply), the loch drained through a bank of gravel, only overtopping at high water levels. This would have had access implications for both salmon and outlet-spawning trout, but may still have been a more favourable situation over the current arrangement (particularly for small fish moving upstream).

Eels are another species which are vulnerable to barriers to migration. Their precipitous decline in recent decades provides an impetus to consider this species whenever improving fish passage is being considered. The migration of young eels (and possibly also of the young of outlet river spawning trout) is a much more gradual process than, for example, the spawning migration of adult salmon and trout or the downstream migration of smolts. A migration route with a year-round flow which is passable to smaller fish would be a valuable addition to this site. A nature-like channel (Photo 15) designed to pass fish at various stages of flow (including a set minimum level) would be a great improvement over the existing channel with weirs (Photo 4).



Photo 15 Nature-like fish bypass channel. A scaled-up version designed to work at different flow stages would be an improvement on existing arrangements at St. Mary's Loch outflow.

St. Mary's AC should take part in the discussions and consultations regarding the proposal to provide flood storage capacity in the reservoir by drawing down the level. The implications for the free movement of fish and the potential effects caused by the timing and extent of the draw down should be carefully considered.

The spawning habitat quality of the spawning burns could be greatly improved. Whilst spawning habitat (gravel) is reasonable, there is a lack of habitat for the juvenile stages of trout and salmon, particularly a lack of deeper water (pools) and low cover (overhanging vegetation, woody debris, boulders, etc.).

A key factor in improving habitat on the burns is the management of grazing pressure. The fencing project carried out by the Tweed Foundation on the Little Yarrow provides a template for the work that needs to be carried out on other burns. Influencing landowners and farmers is the key to successful projects like this one and the WTT's Upland Rivers Habitat Manual (provided during the visit) gives more details on this and the agri-environment schemes available which may assist.

Where some of the burns have been modified to increase flood capacity there is scope for habitat rehabilitation. Again, liaison with landowners / farmers is crucial to get them on board with any proposals. On stretches such as those shown in Photos 6, 8, 10 and 12 the channels could be narrowed using alternate low D-groynes (Figure 2, Photo 16) and deeper areas created with low weir structures (Figures 3 – 5). The latter are designed to create depth and scour downstream of the structure, not impound water upstream. Subsequent fencing of the watercourse is vital to reduce grazing pressure and allow vegetation to develop.

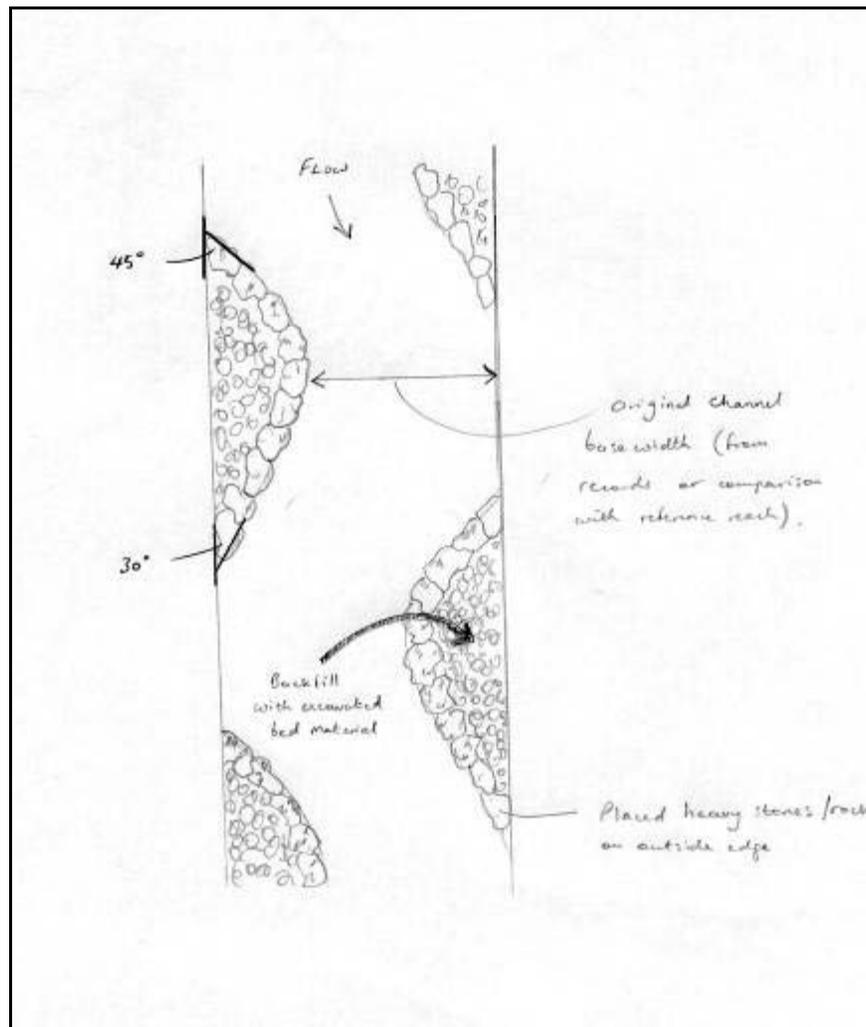


Figure 2 D-groynes on an over-widened channel to restore a natural channel base width.



Photo 16 D-groynes installed on an burn on Orkney. In the absence of grazing, these vegetate quickly. Their low profile allows flood flows to overtop the structures.

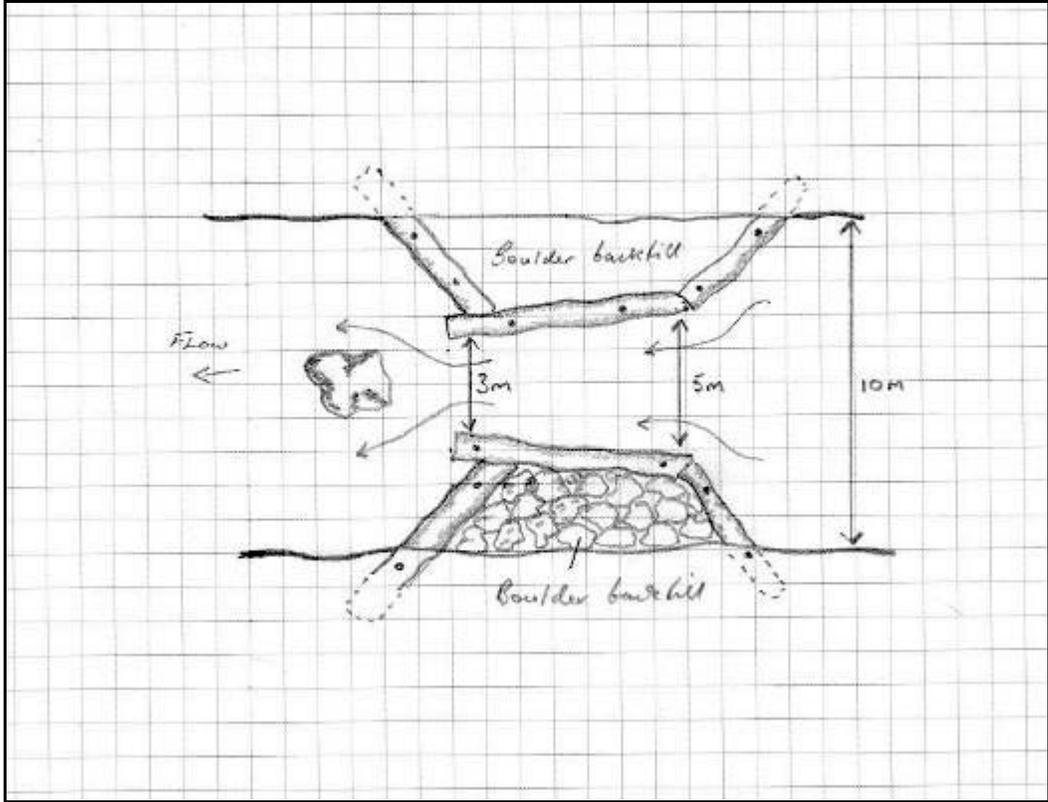


Figure 3 Channel constrictor. For illustrative purposes (dimensions can be ignored)

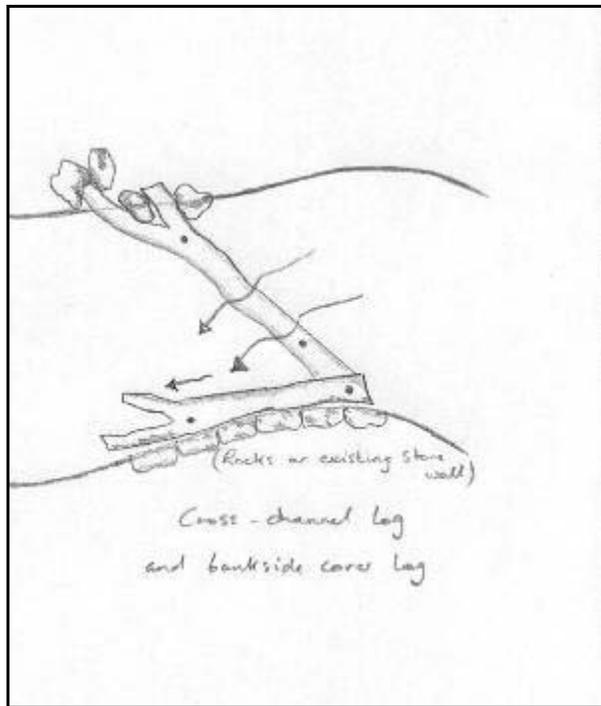


Figure 4 Cross-channel log and cover log

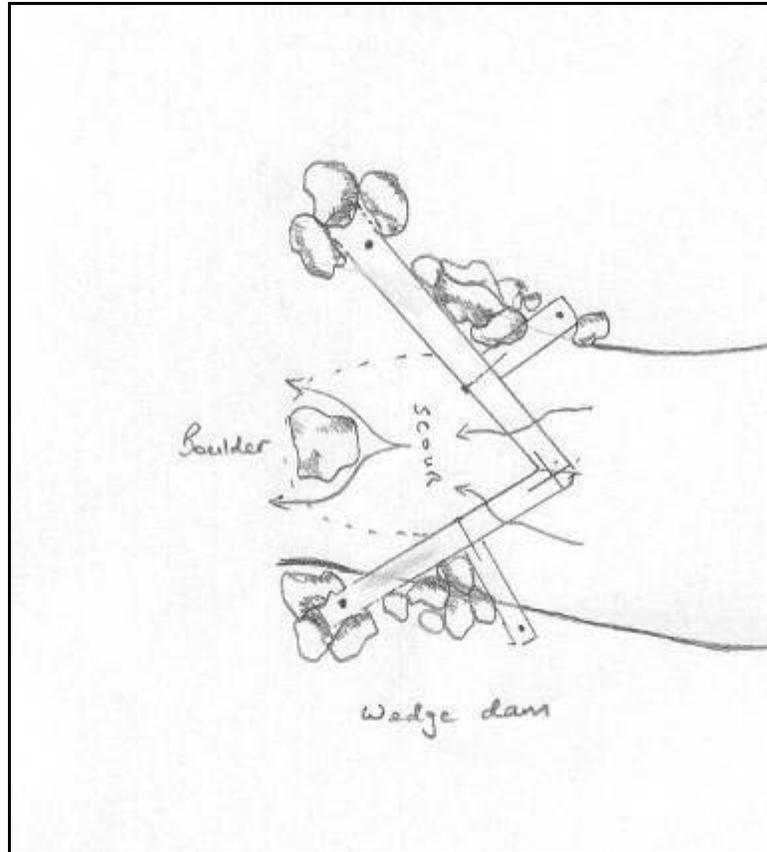


Figure 5 Wedge dam

The impact of Megget Reservoir on Megget Water and its production of juvenile trout and salmon should be investigated further, with consideration given to potential effects on water quality and sediment supply and transfer. The subject could form the basis of an undergraduate or post-graduate research project. If lack of supply of spawning gravel is an issue, then consideration could be given to gravel augmentation; further information on this subject is available at <http://87.84.223.229/FCERM/en/SC060065/MeasuresList/M1/M1T2.aspx?pagenum=2> .

Please note that the Scottish Environment Protection Agency's (SEPA) Controlled Activity Regulations (CAR) apply to works affecting a watercourse and a licence is required from SEPA before any works can be carried out. See www.sepa.org.uk/water/water_regulation/car_application_forms.aspx for further details.

5.0 Making it Happen

For the recommendations involving the reservoir outflow liaison with Scottish Water is necessary. A feasibility exercise leading to the production of a costed design is required; there may be opportunities to carry this out via the SEPA Restoration Fund (www.sepa.org.uk/water/restoration_fund.aspx).

For habitat enhancement on the burns, a detailed project proposal should be prepared which will facilitate liaison with landowners, application for a CAR licence from SEPA and the estimation of the cost of the works. WTT can provide assistance with the preparation of the project proposal.

Raising funds to implement a project is an important consideration. WTT may be able to assist in a number of ways and further advice is available on our website at

www.wildtrout.org/index.php?option=com_content&task=view&id=157&Itemid=157 . A partnership approach is very often the best way forward and the club should explore this with potential partners such as Tweed Foundation, Scottish Water and SEPA.

The implementation of habitat enhancement of the burns could be assisted via a WTT Practical Visit – for more details see

www.wildtrout.org/index.php?option=com_content&task=view&id=109&Itemid=155 .

6.0 Disclaimer

This report is produced for guidance only and should not be used as a substitute for full professional advice. Accordingly, no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon comments made in this report.

References

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Appendix 1 St Mary's Loch & Yarrow Conductivities provided by the Tweed Foundation

CONDUCTIVITIES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average	Grid Ref.
	19.01.06	14.02.06	15.03.06	13.04.06	23.05.06	13.06.06	25.07.06	17.08.06	28.09.06	25.10.06	not poss	28.12.06		
Thirladean	64	86		81	77	102	94	83	88	98		118	89.10	44330 27594
Yarrowford Car Park	64	83	85	79	73	93	83	76	81	88		86	81.00	40810 30006
Tinnis Fish Farm	59	81	81	73	70	85	79	73	78	74		78	75.55	37056 28020
Ladhope Bridge	59	77	79	71	63	77	73	69	73	77		80	72.55	34508 26539
Gordon Arms Bridge	57	69	70	65	60	70	63	66	66	66		72	65.82	30867 24709
Below Douglas B. entrance	59	65	68	66	60	68	62		79	98		77	70.20	29278 24232
Douglas B	62	82	83	80	72	108	103	126	77	118		91	91.09	29133 24466
Craig Douglas	48	55	55	50	53	60	54	61	62	52		53	54.82	28610 24415
St. Mary's Outflow	50	50	52	53	53	54	54	59	59	58		52	54.00	27016 23880

Meggat W	36	29	40	33	33	38	38	32	31	46		40	36.00	24170 22613
Between the lochs	59	62	72	60	66	72	70	83	68	65		55	66.55	20870 20471
Little Yarrow at Riskinhope	51	43	104	58	63	112	108	126	52	88		95	81.82	23368 19035

Note the difference between the Meggat Water and the Douglas Burn (first major Yarrow tributary downstream of St Mary's Loch) – both in red.
And the difference between the Yarrow entering St Mary's (Little Yarrow) and exiting – both in blue.