THE RIVER DON TRUST- *"River in harmony"*

RDT Briefing Note; Determining Broodstock Progeny Placement 2011/12

Don Board staff Martin Webster and David Mackay planting out an 'artificial redd' in Feb 2011 on the Littleglen Burn on the Water of Nochty, whilst being filmed by Bernard Martin one of the River Don Trust directors.

Introduction

During the year 2010-11 the River Don Trust (RDT) recommended that the Don District Salmon Fishery Board (DDSFB) adopt some new policies for broodstock management, these include the suggested protocols for broodstock capture and crossing, and also recommendation for planting out the progeny at suitable locations. The purpose of the 2011-12 briefing note is to incorporate these former documents and by using the further data available, recommend suitable practices for the 2011-12 season of broodstock capture, crossing and progeny placement.

This year's programme has the benefit of using the previously collated data and this summer's Electro fishing data following the 2010-11 Progeny planting. We also have a measure of how manageable the new crossing procedures were and how much work is involved in the planting out process and this will enable the two organisations to ascertain how much work can feasibly be carried out within the resources available.

The current distribution of migratory fish present within the catchment is limited by a number of factors, but primarily obstacles to their migration such as weirs, culverts and fords. Whilst a few of these exist in the upper catchment where the stocking occurs the majority are in the middle and lower catchment. The RDT is working with the Don DSFB to ease man made obstacles and debris obstacles at present but for the most part these have been in the lower and middle catchment where there are greater pressures such as forestry and historical and current industries. In the upper catchment where none have been eased to date the practice of stocking above these obstacles has been employed as recommended last year, this practice will be continued this year as well.

Background

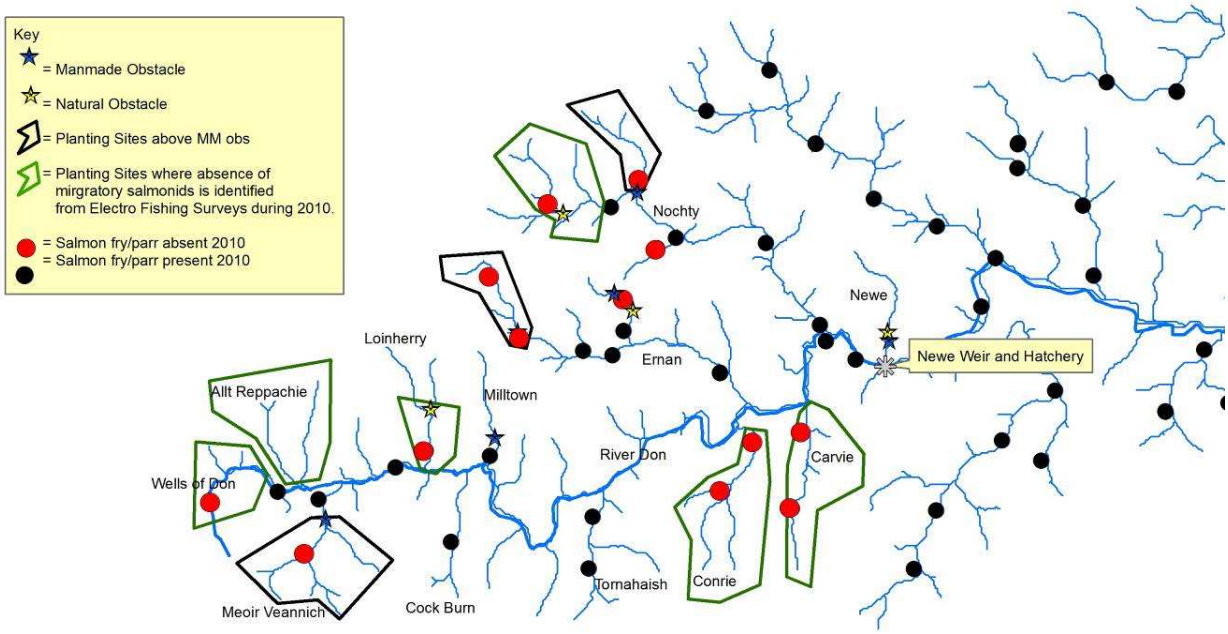
During the 2010-11 season approximately 311,000 salmon and 36,000 sea trout eggs were planted out between the months of February and March 2011 in artificial redds by the Don DSFB staff. It was apparent from the recommended stocking locations that these figures would result in an overabundance of hatchery stock. This was due to the document being produce following the broodstock capture process. It was suggested that the surplus stock be planted out into the upper main stem where the Don DSFB staff were aware of areas of reduced spawning incidences.

As a result this document aims to recommend appropriate measures for collecting, crossing and planting out hatchery stock for the 2011-12 seasons from the outset. This should enable a more appropriate number of broodstock to be collected to populate the areas identified for planting with broodstock progeny preventing any surplus broodstock being stripped.

In order to determine the most suitable locations for broodstock progeny for the 2011/12 season information from electro fishing, habitat surveys and broodstock progeny placement data was collated and analysed on a map based Graphical Interface System (GIS).

The following outputs illustrate the information collated; each map has been cropped to only illustrate the area above the Newe Weir where appropriate broodstock progeny placement can occur.

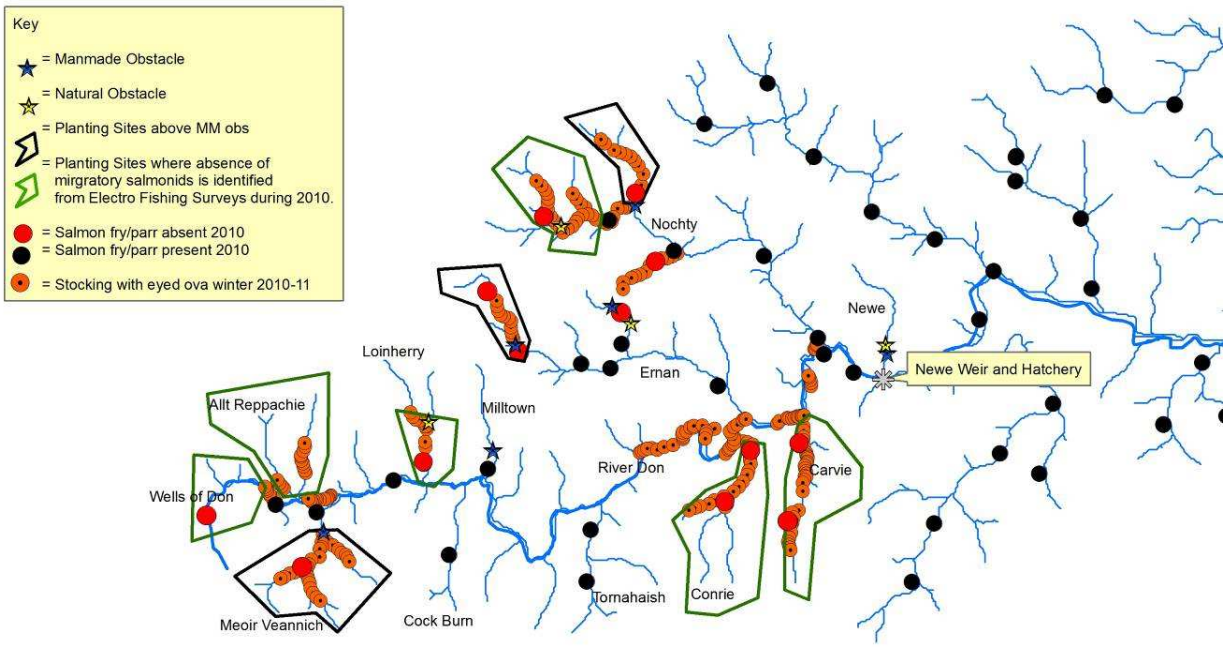
Map 1.



Illustrates the locations of recommended stocking for 2010-11 as highlighted by the coloured polygons. Electro fishing sites during the summer of 2010 are represented by coloured dots, Red dots are sites where salmon fry or parr were absent and Black where they were present.

It's clear from the electro fishing results as illustrated in Map 1 that there was a requirement for stocking in the areas highlighted. It seemed that there was a significant under use of these areas of the catchment and by introducing hatchery stock to these areas the potential to enhance juvenile salmon stock could be achieved.

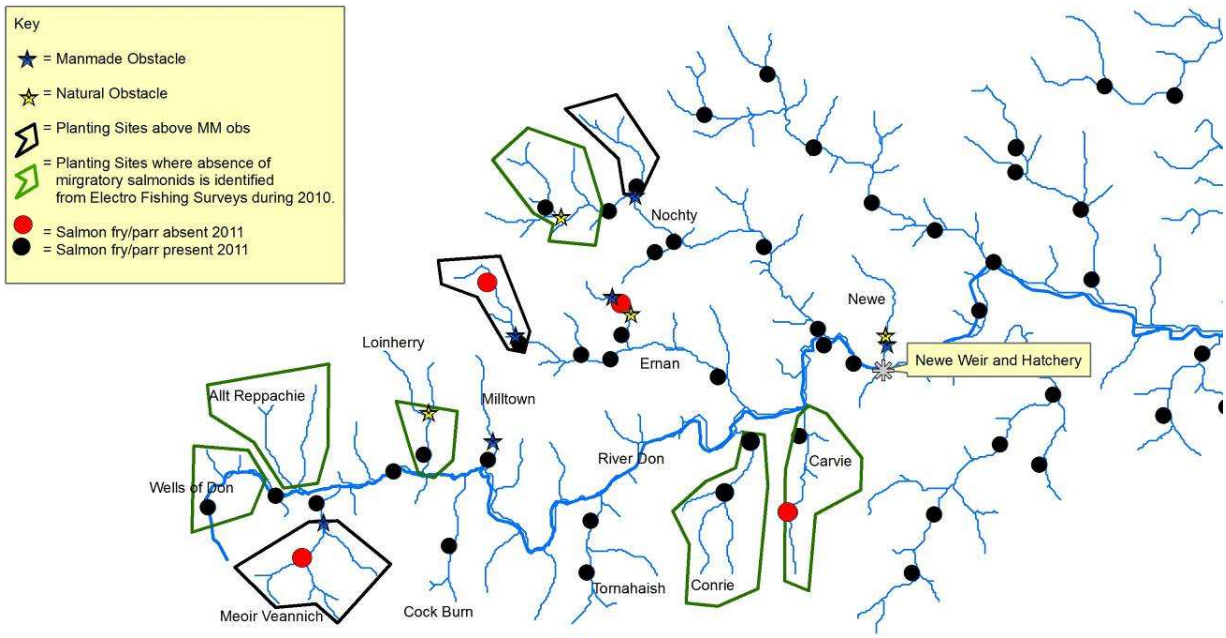
Map 2.



Illustrates the locations of artificial redds as recorded in the field using GPS by the DDSFB during the Feb-March of 2011. Approximately 311,000 salmon and 36,000 sea trout eggs were planted out between the months of February and March 2011 in artificial redds by the Don DSFB staff. Redds are illustrated using orange circles with dots.

The judicious use of stocking in the recommended areas allowed for the vast majority of the broodstock progeny from last year (if you recall we had anticipated a volume of eggs surplus to requirements) to be planted within the recommended areas. Those that weren't were stocked in either in the main stem where abundance of spawning was deemed to be low by the Don DSFB staff or placed in a tributary to the Nochty the Quillichan Burn.

Map 3.



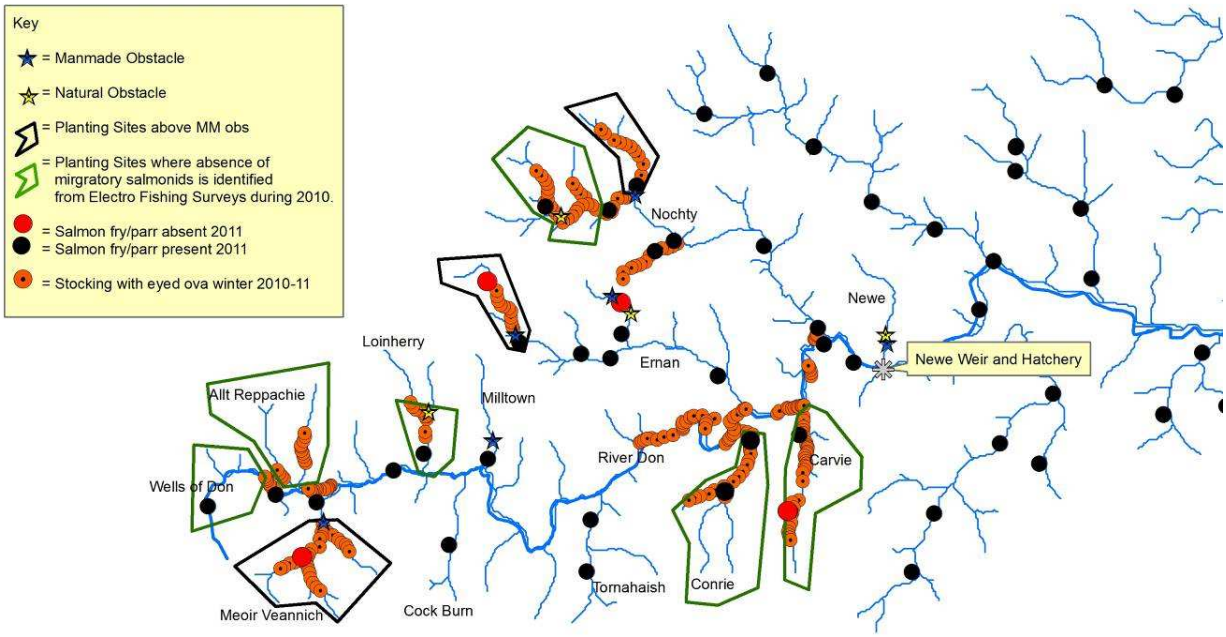
Illustrates the results from electro fishing sites during the summer of 2011. Sites are represented by coloured dots, Red dots are sites where salmon fry or parr were absent and Black where they were present.

It is clearly evident from Map 3 that the programme of stocking during the 2010-11 season was successful in populating the areas as identified by the electro fishing in the previous year as being devoid of salmon. Abundance estimates have not been fully calculated for this years electro fishing results to date but his information will be reported upon in due course. Other sites out with traditional electro fishing locations were quickly assessed using presence and absence surveys to identify if the artificial redds were successful.

The current presence of juvenile salmon in these areas as a result of the stocking will encourage wild fish to seek out spawning grounds in these areas in future owing to the fact that the chemical cues 'given off' by the juvenile salmon suggest to the wild adult salmon that these habitats are suitable spawning and juvenile rearing habitats.

It is anticipated that further stocking will be required to build up a temporal population of juveniles representing different year classes in order to be confident that wild populations will reestablish these areas naturally. However easing manmade and debris obstacles will go a long way to achieving similar results and may prove to be a more cost effective means of managing these salmon stocks.

Map 4.



Illustrates the locations of artificial redds in relation to the electro fishing sites carried out during the summer of 2011.

It was apparent that some stocking did not result in juvenile salmon establishing in these stocked areas, such as on the upper Carvie Burn and Meoir Veannich. There may be several reasons for these results; firstly it could be that the electro fishing sites were not selected as accurately in relation to the redd sites resulting in a poor chance of encountering fry which often only disperse a maximum of 500m from the redd site in their first year, secondly it may be that the artificial redd failed due to natural wash out as a result of a spate, thirdly the eggs were mixed with an infertile male in the crossing programme resulting in an unfertile redd, fourthly it may be that there are issues relating to the redd site and the water chemistry, where redds can fail due to a lack of mixing of oxygenated water with the deoxygenated ground water at a site, if for instance they are buried to deep.

Conclusions

Following last year's recommendations and the data gathered from this year's electro fishing surveys it is evident that the stocking programme has been successful in populating areas of the catchment which were deemed to be only partially passable to migratory fish or where there were no migratory fish present.

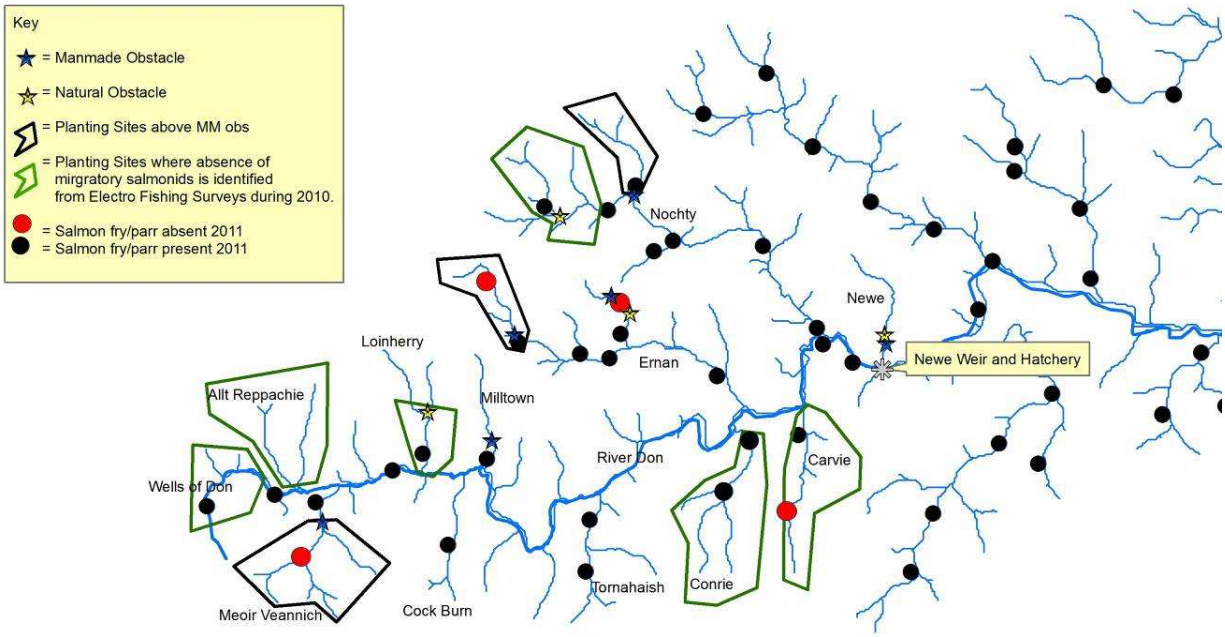
These areas were stocked with broodstock progeny under the assumption that there would be no intraspecific competition with wild salmon, whilst it was not possible to ascertain how true this assumption was this year due to the hard winter and lack of suitable redd counting conditions, it has been found that only on occasionally years are these obstacles passable due to missing year classes of juvenile salmon found in electro fishing surveys.

We can therefore say that by planting out broodstock progeny in these partially inaccessible areas we have been successful in increasing the potential smolt output of these tributaries in forthcoming years.

Whilst this method has proven to be successful, the future recommendation would be to remove or ease these obstacles to allow natural spawning to take place as this is on all accounts always the preferred method when compared to hatchery techniques. The areas where there are no perceived issues relating to obstacles but yet migratory fish were absent have now also been given a kick start again. Perhaps seasonal variances in flow restricted these catchments from being populated over the past few years but hopefully now with juvenile salmon present in these catchments again this will encourage wild adult salmon to ultilise these tributaries for spawning once more.

In recognition of the requirement to continue to stock above these manmade obstacles until they are eased and to assist in the recovery of those illustrating partial salmon presence it is suggested that stocking continue but at a greatly reduced rate from the 2010-11 season. A more refined volume of stock has been identified to populate these areas (Appendix 1.) and a recommended figure of 150,000 eggs would allow for the same suggested locations as the 2010-11 season to be fully saturated.

Map 5.



Illustrates the preferential areas for stocking determined from the data analysed for the 2011-12 season. Black polygons represent areas of the catchment currently inaccessible to migratory salmonids due to manmade obstacles. Green polygons represent areas of the catchment currently underused by Salmon.

Key recommendations for 2011-12

- It's recommended that the artificial redds be created as previously by the DDSFB but that the depth of a redd should not exceed 15cm to avoid ground water intrusion and low dissolved oxygen impacting egg survival. It's also suggested that some containers be used to ascertain the survival of eggs to fry in some of the sites especially those with known problems relating to survival.

- Suggested densities for artificial redds should equal 5eggs/m^2, which is equal 500eggs per 100m^2 this would provide more a manageable figure for planting out with anticipated coverage of fry primarily 100m downstream of the redd site. Maximum known fry dispersal distances are 500m downstream of a redd site so we can again use this figure to prevent any overlap and competition between broodstock progeny. Redd sites should be separated by at least 250m at a rate of 1000eggs/redd.

- Habitat suitability has also been considered and recent research has shown that fry survive in habitat which is not suitable for adults to spawn in and therefore could increase the potential area of available habitat to be targeted. Areas such as this should be targeted where appropriate as long as an artificial redds can be created in order to maximise potential coverage.

- Ultilise the same areas as 2010-11 for broodstock placement but with the intention to saturate these areas at the aforementioned redd rate paying particular focus to those above manmade obstacles (Appendix 1).

- It is also recommended that no stocking is to take place in the main stem of the Don below Delnadamph as it is expected that there are no issues for migratory fish access in the main stem and as a result stocking would not be required.

- No Brown or Sea trout are to be used for broodstock this year, on the principle that we cannot be confident upon the impact (positive or negative) we may be having with both of these populations.

- Follow the same protocols for crossing as 2010-11 selecting fish over 70cm scaling, weighing and tagging these to allow us to ID Run Types again before crossing (Appendix 2).

- It is also suggested that it be constructive to collect and tag other fish not being used for the broodstock owing to the fact that they are caught as by-catch during the collection process. The impetus for this being that the Trust intends to run the Anglers Floy Tag/Scale Reading Programme again and to ascertain if tracking to spawning grounds of Tagged fish can be achieved through the Redd counting programme.

Appendix 1.

Table 1. Recommended tributary locations of artificial redds and rate of egg depositition.

Location (Those in bold are above manmade obstacles)	Habitat Available	Redds (1000eggs/redd)
Ernan Burn	**3km**	**12**
Nochty Burn	**3km**	**12**
Allt Veannich	**4.5km**	**18**
Nochty Burn-Quilichan Burn	1.5km	6
Nochty Burn-Allt na Caillich Burn	1.5km	6
Nochty Burn-Allt ant-Sluichad Mhoir	2km	8
Conrie Burn	6km	24
Carvie Burn	4km	16
Loinherry Burn	1.5km	6
Upper Don-Feith Bhait	2km	8
Upper Don-Allt Reppachie	1.5km	6
Upper Don-Allt nan Aighean	1.5km	6
Upper Don-Allt Tuileach	2km	8
Total	**34km**	**136 Redds**

Appendix 2.

Excerpt from the RDT Hatchery and Broodstock Protocols 2010

Action	Methods	Reason
Collection	1. Using electro fishing, habitat, redd count and previous hatchery stock placement data to determine number of broodstock. 2. Collect broodstock at Newe weir 3. Collect 'most valuable' stock component for broodstock i.e. fish over 70cm. 4. Floy tag all fish caught during broodstock collection process at Newe weir. 5. Ensure that scale and genetic samples are collected from broodstock used. 6. Floy tag, scale and genetic sample spawning brown/sea trout	1. Determine the number of broodstock required for stocking system at carrying capacity. 2. Due to current practice and lack of potential for direct broodstock capture from spawning sites. 3. Valuable broodstock is interpreted as MSW fish or those fish assumed by physical characteristics to be of spring or summer run types, later confirmed by scale reading. 4. To ascertain number of fish which re ascend weir and drop back. 5. To identify life history and genetic information for each fish. 6. To ascertain further information on life history, genetics and relate to anglers potential catch records for future projects.
Stripping/Crossing	1. Cross males and females which are ripe on the same day. 2. Divide spawners into groups of approx ten each i.e. ten females and ten males. 3. Strip all females separately and then mix eggs into one tub. 4. Divide eggs into batches, equal to number of males to be used (i.e. 10 Females x10 Males.) 5. Use single individual males to fertilise each batch of eggs. 6. Follow current incubation procedures with intent to 'release' as 'eyed ova'	1. Minimise inbreeding, reducing family effects. 2. Straightforward practice and easy handling of individual fish. 3. As above. 4. Enabling separate crosses to be performed and recorded. 5. Prevent mixing of milt and sperm competition. 6. Best practice, cost effective and best survival.
Planting Out	1. Using electro fishing, habitat, redd count and previous hatchery stock placement data to determine locations for planting out.	1. Identify the best possible location for hatchery stock to prevent competition with existing

	2. Only release hatchery stock within the potential natural range of wild spawners. 3. Plant out as eyed ova in 'artificial redds' in appropriate densities at multiple sites.(Info to follow) 4. Eggs planted out as early as viably possible and at period when hatchery temperature mimic's possible stocking location's. 5. If planted out as 'unfed or fed fry' use appropriate densities at multiple sites as for 'artificial redds'.	wild fish and increase chance of hatchery stock survival. 2. Reduce detrimental impacts to native trout stocks above natural obstructions. 3. Best survival rates, minimal husbandry and easily transportable. 4. Reduces the mismatch of natural timings relating to egg hatching and food availability. 5. Reduces competition and also predator affects which may also adversely impact wild fish.