



SHRImP 2013 Semi-quantitative Electro-fishing Survey



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Introduction

The Westcountry Rivers Trust (WRT) undertook semi-quantitative fry index electrofishing survey throughout the River Avon and at a single site on the River Erme between the dates of 2nd and 9th October 2013.

The surveys were targeted to complement the Environment Agency (EA) electric fishing monitoring undertaken in 2013. A total of 11 sites on the Avon, 8 sites on the Erme and 2 sites on the Yealm were surveyed by the Environment Agency.

The strength of the fry index survey is to enable a quick, affordable, baseline semi-quantitative catchment wide view of the fry life stage only. As this survey is indicative of a single year, it is important to interpret the results with caution. This electro-fishing survey will aid as a tool to monitoring and inform appropriate habitat restoration works under the South Hams River Improvement Project.

Survival of salmonid fry to the end of the first summer is known to be poor. Up to 90% of the alevins that emerge from redds will not survive. Even in good quality habitat with a rich food supply, high densities of fish will undergo strong competition for resources with each individual trying to gain a profitable feeding station. The fry index surveys are used as a coarse measure of fry numbers/abundance at each particular site. For each single year it also gives a broad indicator of salmonid spawning success across a catchment.

Site Selection and Permissions

Sites (Figure 1) were selected to provide representative samples from distinct river reaches, characterized by habitat type, proximity to barriers and proximity to targeted restoration works under the SHRImP project.

Where possible, site locations were selected at or very near to historical EA electro-fishing sites to build upon the existing historical data set. Permissions and access to sites was arranged by telephone or cold-calling on landowners.

A shallow riffle section was chosen at, or as near as possible to, each selected survey location. The sites marked in Figure 1 represent the actual sites fished, rather than the sites initially identified for sampling. The completion of the walkover surveys on the Avon and Erme in 2013 was particularly valuable in identifying available fry habitat within the catchments.

In addition to those sites surveyed on the Erme and Yealm in 2013, a further six sites were targeted on the Yealm. However, it was unforeseen that the EA permissible season for survey on the Yealm ended on 30th September, which left insufficient time for survey within WRT's planned programme.

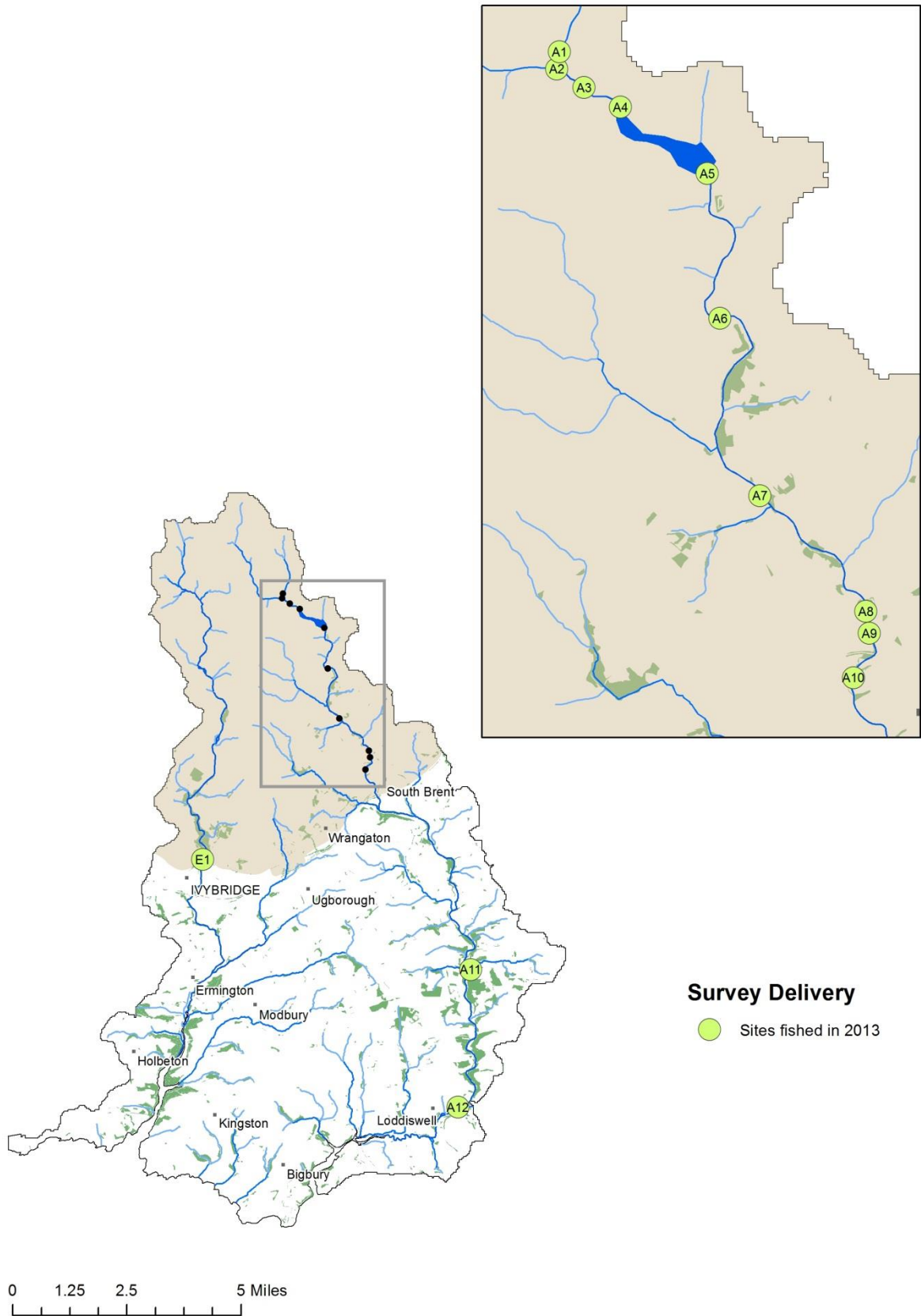


Figure 1: Survey sites sampled by WRT in 2013

Field sampling and data analysis methods

Each site was electro-fished by a two person team using an E-fish 500W single anode backpack. The unit was predominantly fished at the same settings of (50Hz at 350v), although the frequency was reduced to 40Hz where the conductivity was found to be particularly low, particularly in the headwaters and moorland streams.

The operatives fished continuously for a standard five minutes within fry habitat where sufficient area was available. Both Sites 7 and 8 were only fished for 3 minutes and should therefore be interpreted with caution. Table 2 also details where there was a lack of, or unsuitable, habitat available. Fishing was undertaken in either an upstream or downstream direction depending upon the conditions at individual sites. Fish were collected in a net and placed into a holding bucket.

All Salmonids were identified to species and fork length measured and recorded. Numbers or density estimates were recorded for all other species captured. Habitat features such as land use, substrate type and shading were recorded at each site. A photograph of each site was also taken.

Based on the lengths of fish captured during the survey fry were considered to be any individual that measured less than 80mm. Fry numbers recorded at each site were classified according to the methodology by Crozier & Kennedy (1994) (Table 1). The classification scheme has been taken from the original salmon fry index provided within this paper and was derived through establishing a relationship with equivalent fry numbers captured within quantitative surveys at sample sites within Ireland. Within this assessment report, the salmon fry classification has also been used as a surrogate for trout fry. Results should therefore be treated with some caution. It would increase the robustness of the method to be calibrated to local conditions, and for trout, to conduct the method alongside Environment Agency quantitative electric fishing surveys in future years.

Table 1. Semi-quantitative abundance categories for salmon fry (Crozier & Kennedy, 1994)

Density Classification	Semi-quantitative (n/5min fishing)
A (excellent)	>23
B (good)	11-23
C (fair)	5-10
D (poor)	1-4
E (absent)	0

Any fry that were missed or escaped during electro-fishing were assigned to either trout or salmon groups depending on the relative percentage of each species already recorded at the site.

Table 2. Site details including classifications and species observed. * = Fished for 3 rather than 5 minutes.

Site ID code	Site Name	NGR	Survey date	Salmon Fry class	Trout Fry class	Bull-head	Eel	Comments
A1	US Avon Dam 1	SX 67087 65795	09.10.2013	Absent	Good			
A2	US Avon Dam 2	SX 66482 66345	09.10.2013	Absent	Excellent			
A3	US Avon Dam 3	SX 66455 66175	09.10.2013	Absent	Fair			
A4	US Avon Dam 4	SX 66725 65990	09.10.2013	Absent	Good			
A5	DS Avon Dam	SX 67949 65137	02.10.2013	Absent	Poor			High flows (Avon dam spilling + hydropower releasing)
A6	Woolholes	SX 68076 63702	02.10.2013	Absent	Poor			Limited habitat available / high flows (Avon dam spilling + hydropower releasing)
A7*	Didworthy	SX 68471 61944	02.10.2013	Poor	Poor			Limited habitat available / high flows (Avon dam spilling + hydropower releasing)
A8*	US Lydia	SX 69523 60796	02.10.2013	Poor	Poor			Survey abandoned twice (at different flows 02.10.2013 & 07.10.2013) due to unsuitable conditions (high flow / deep water). Trout captured from the Mill Race next to the site.
A9	DS Lydia	SX 69556 60578	07.10.2013	Good	Absent			
A10	DS Brent Island	SX 69399 60139	07.10.2013	Fair	Poor			
A11	DS Gara Bridge	SX 73111 53089	09.10.2013	Poor	Poor	P		
A12	DS Loddiswell Bridge	SX 72661 48234	07.10.2013	Poor	Absent	P	P	
E1	Erme – US Ivybridge	SX 63653 56966	10.10.2013	Poor	Poor			

Results

Figure 2 and figure 4 show the spatial distribution of salmon and trout classification respectively. The classification results are also summarised in Table 2. Figure 3 and Figure 5 show the spatial distribution of the numbers of fry captured at each site for salmon and trout respectively. Figure 6 shows relative contributions of salmon and trout to the total catch at each site.

The Avon Catchment

Salmon

Salmon fry were absent from the upper reaches of the Avon above Shipley Falls. Didworthy was the most upstream site at which salmon were recorded. The two sites downstream of Lydia Falls were the most productive and were assigned 'good' and 'fair' classifications at DS Lydia Falls (Site A9) and Downstream Brent Island (Site A10) respectively. All remaining sites were classed as poor, with four or fewer individuals captured per survey.

Individual lengths of salmon captured ranged between 50 and 149mm.

Trout

The sites upstream of the Avon dam were the most productive sites for trout with classifications ranging from 'fair' to 'excellent' at Site A3 (Upstream Avon Dam 3) and Site A2 (Upstream Avon Dam 2) respectively. Trout were absent at Site A9 (DS Gara Bridge) and Site A12 (DS Loddiswell Bridge) and 'poor' at all other sites.

Individual lengths of trout captured ranged between 49 and 214mm.

The Erme Catchment

The single site surveyed (E1, US Ivybridge) was classed as 'Poor' for both salmon and trout fry. Individual lengths ranged between 73 and 132mm for trout, and 59 and 96mm for salmon.

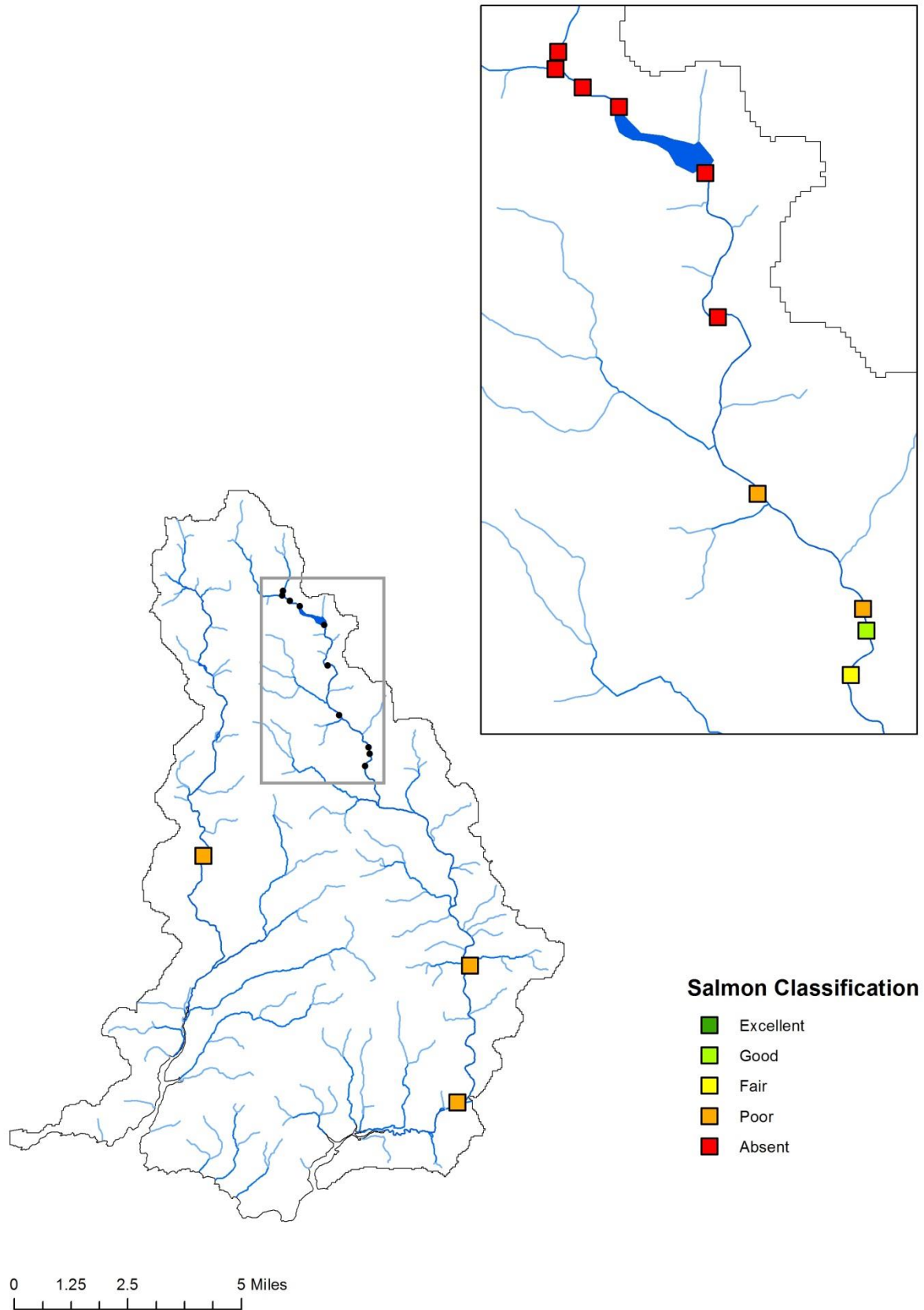


Figure 2: Site classifications for salmon fry within the Erme and Avon catchments

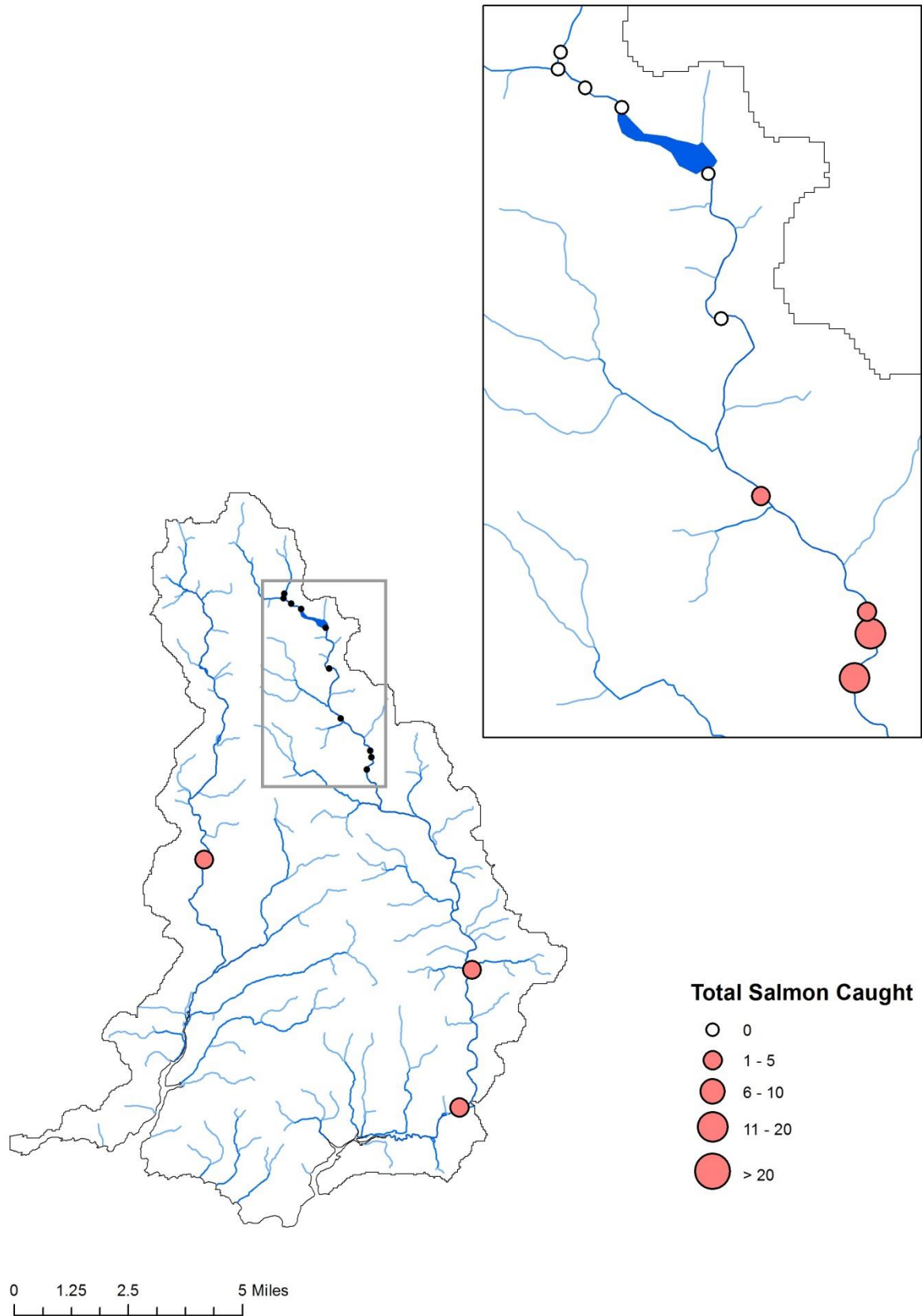


Figure 3: Total salmon fry caught within the Erme and Avon catchments

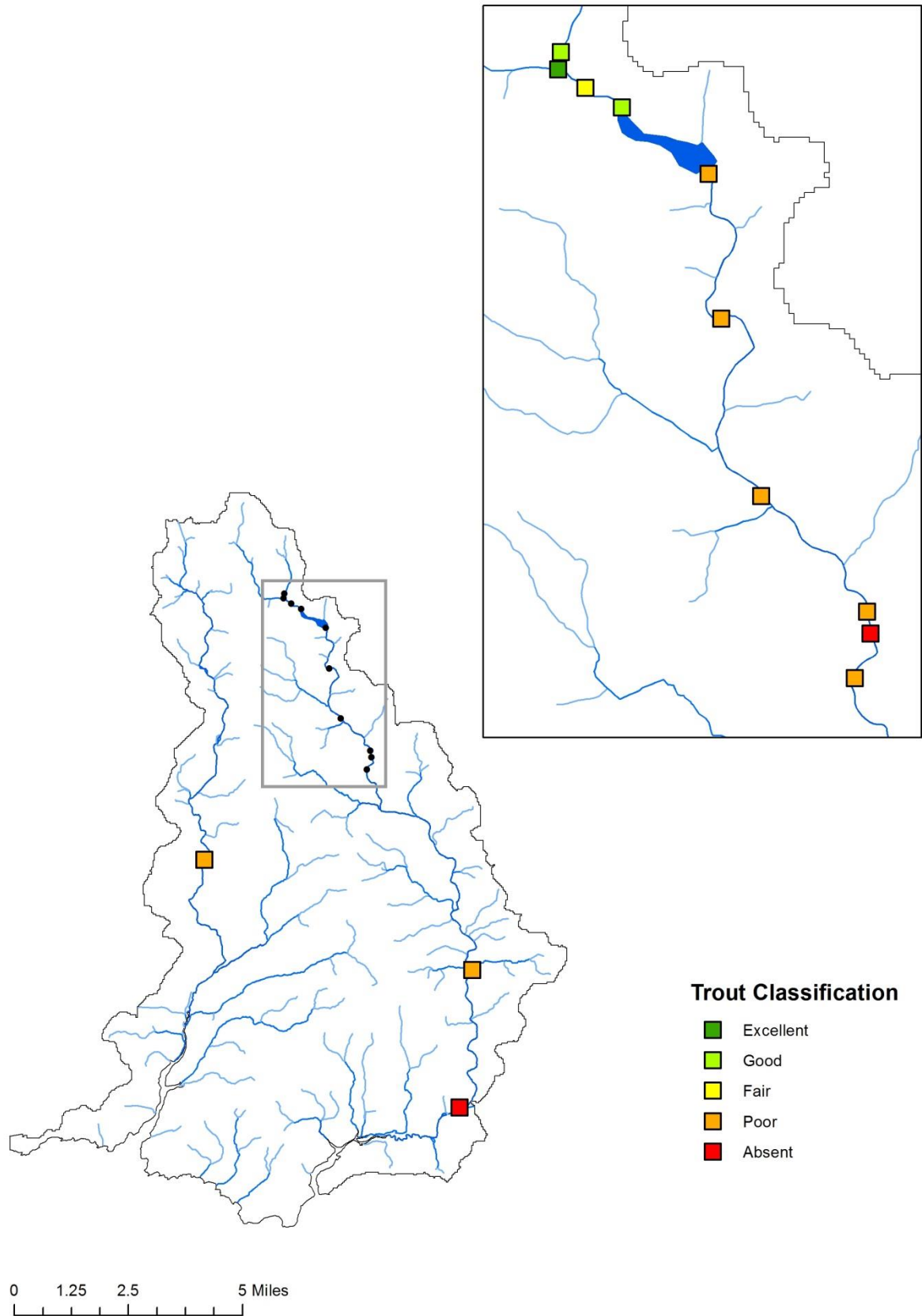


Figure 4: Site classifications for Trout fry within the Erme and Avon catchments

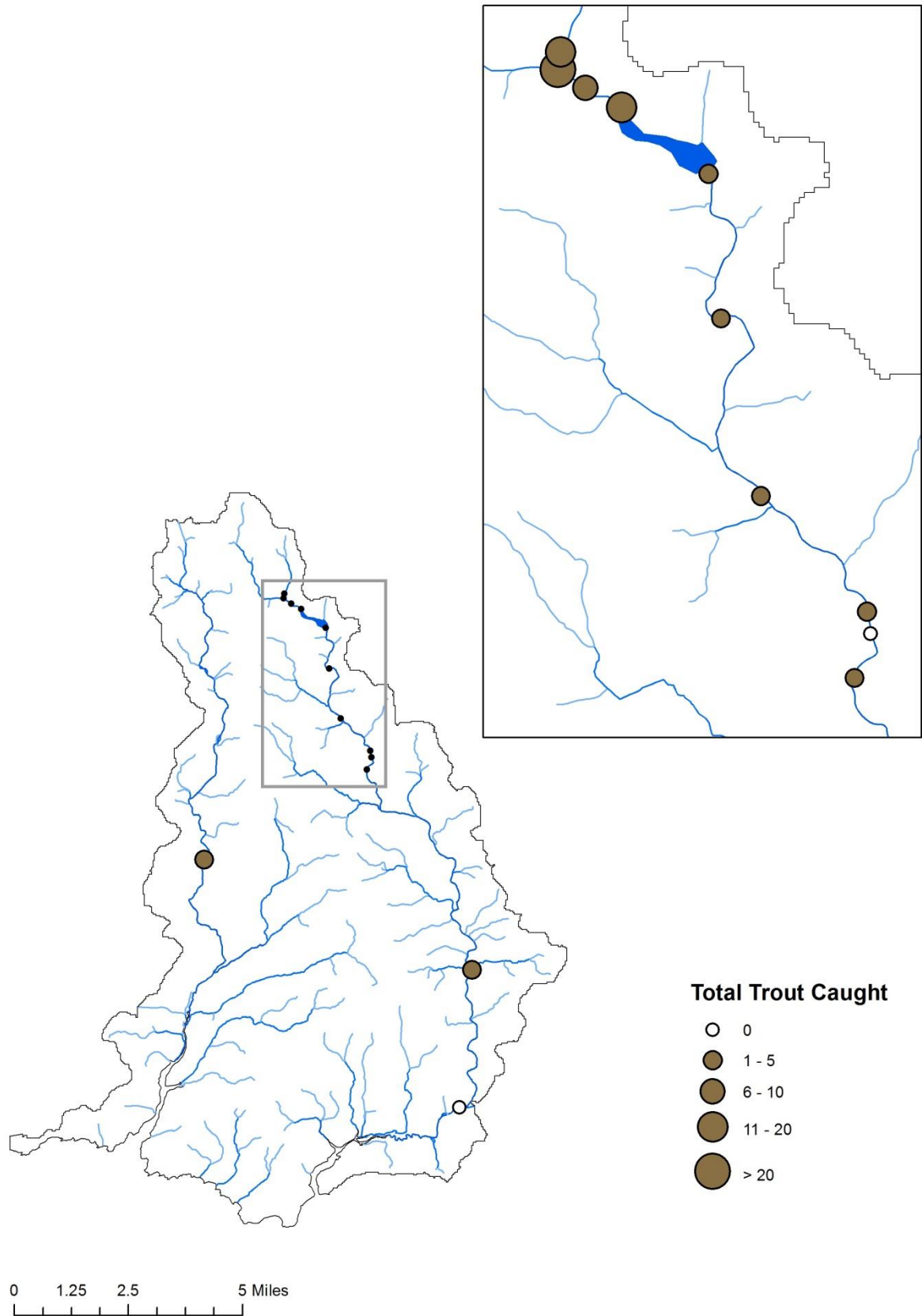


Figure 5: Total trout fry caught within the Erme and Avon catchments

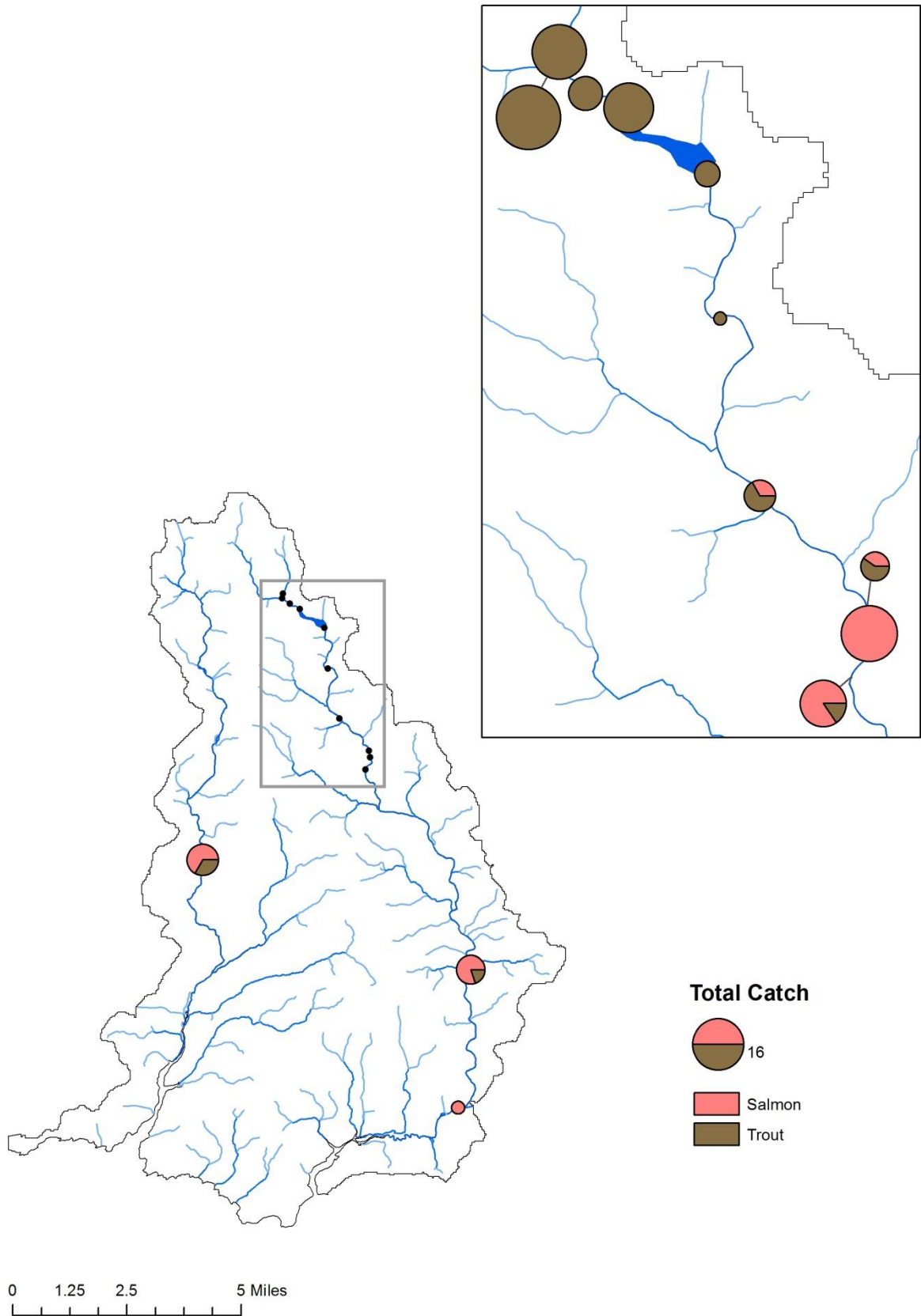


Figure 6: Trout and Fry comparisons (*The size of the circle is relative to the total number of fish captured, see legend (under total catch) for size if n=16)

Discussion and Recommendations

The results presented within this report provide a baseline for the South Hams River Improvement project. It is important to note that they provide a snapshot in time and, in the absence of any temporal comparisons, interpretation of the results is limited.

The survey results support previous EA survey findings and subsequent WFD classifications (2009) that there are fewer than expected salmonids at the majority of sites. The most productive site for salmon ('good' Classification) was Site A9, which is the first riffle downstream of Lydia Falls. It is expected this site should receive high numbers of fry from adults unable to migrate up the high falls. However further downstream fewer than expected salmon were recorded (Fair or poor). Despite 'good' status classification of Avonwick station within the 2009 WFD assessment, the current survey would suggest failure at all sites surveyed from South Brent downstream in 2013. The fewer than expected numbers at the two sites upstream of Lydia falls and downstream of Shipley may also be compounded by the lack of available habitat as a result of the natural morphology of that section (dominated by very steep gradient, chutes and bedrock) rather than habitat quality per se.

Trout were the only species captured at the four survey sites upstream of Shipley Falls; therefore it is assumed that Shipley dam presents a barrier to the upstream migration of salmon and other species with the possible exception of elver (eel), which may have been missed by the survey method targeted at salmonid fry. The 'fair' to 'excellent' trout classifications upstream of the dam, compared to 'poor' to 'absent' downstream, is likely due to: absence of competition from other species, a more naturalised flow regime and sufficient availability of gravel substrate to provide more suitable habitat for fry. Moreover this section is characteristic of a smaller stream habitat which would be expected to provide more suitable trout rearing habitat compared to downstream, main river sites.

Any interpretations drawn from the results should be considered within the context of any limitations of the survey. The main limitation was the availability of suitable fry habitat in which to conduct surveys within some reaches. This was exacerbated by elevated river levels at the time of survey, particularly within the upper reaches of the River Avon downstream of the Avon dam. That said, survey conditions were considered adequate to at least detect the presence of either salmon or trout. For example, Site A7 and Site A8 had the least suitable fry habitat and survey conditions of any sites, yet surveys identified the presence of one and two salmon respectively.

The single site on the Erme (E1, US Ivybridge) is within a very steep gorge like section upstream of Ivybridge. Despite the poor classification for both species, the presence of both salmon and trout fry is positive given the lack of optimal spawning and rearing habitat available at a reach scale.

In addition to recording fish species and number, genetic samples were also collected on the Avon. This was targeted to determine genetic comparisons between the trout population up and downstream of the Avon Dam and whether there is successful downstream migration of smolts from above the dam.

As well as establishing a baseline of the river's juvenile salmonids, the results from the electro-fishing survey, together with EA electric fishing data and walkover survey data are vital in targeting priority areas for habitat improvement works. In future years surveys will provide a crucial tool in monitoring the effectiveness of these works.

Conservation recommendations

- Review data in combination with EA 2013 electric fishing results to increase understanding of the spatial distribution of salmonids.
- Salmon redd counting in autumn 2014 would aid interpretation of fry index results.
- Target sites downstream of Avon dam for gravel introduction as per SHRImp bid to improve habitat available for juvenile salmonids as far as South Brent.
- Undertaken fish easement works at Brent Island Weir and Crackhill weir to improve access to sites downstream of Shipley Bridge (under planning preparation, due to be constructed in spring 2014).
- Undertaken fish easement works at Venn Weir to improve passage to the entire River Avon (under planning preparation, due to be constructed in spring 2014).
- Remove Harford Weir on the River Erme to improve fish passage to suitable spawning and rearing habitat available upstream (under planning preparation, due to be removed in spring 2014).

Acknowledgements

Thanks to all landowners involved for their kind permission to access sites, including the Duchy of Cornwall, Ivybridge Town Council and South West Water. We thank the Environment Agency for providing survey site location information and the Avon Fishing Association for their continued support.

Appendix 1: Fisheries data result tables

Avon and Erme Semi-Quantitative Juvenile Electro-Fishing Results – WRT 2013 (Based on the Crozier & Kennedy model, 1994) (Eel and Bullhead: P = Present, A = Absent)

Site ID code	Site Name	NGR	Total Salmon 0+ Caught	Total Trout 0+ Caught	Total Salmon 1+ Caught	Total Trout 1+ Caught	Missed 0+ Salmonids	Bull-head	Total Salmon Fry (<i>derived value</i>)	Total Trout Fry (<i>derived value</i>)	Salmon Fry class	Trout Fry class	Bull-head log value	Eel (P/A)
A1	US Avon Dam 1	SX 67087 65795	0	14	0	11	4	0	0	18	Absent	Good	A	A
A2	US Avon Dam 2	SX 66482 66345	0	20	0	7	5	0	0	25	Absent	Excellent	A	A
A3	US Avon Dam 3	SX 66455 66175	0	5	0	6	2	0	0	7	Absent	Fair	A	A
A4	US Avon Dam 4	SX 66725 65990	0	10	0	4	5	0	0	15	Absent	Good	A	A
A5	DS Avon Dam	SX 67949 65137	0	3	0	4	1	0	0	4	Absent	Poor	A	A
A6	Wool-holes	SX 68076 63702	0	1	0	5	0	0	0	1	Absent	Poor	A	A
A7	Did-worthy	SX 68471	1	3	0	1	2	0	2	5	Poor	Poor	A	A

Site ID code	Site Name	NGR	Total Salmon 0+ Caught	Total Trout 0+ Caught	Total Salmon 1+ Caught	Total Trout 1+ Caught	Missed 0+ Salmonids	Bull-head	Total Salmon Fry (<i>derived value</i>)	Total Trout Fry (<i>derived value</i>)	Salmon Fry class	Trout Fry class	Bull-head log value	Eel (P/A)
		61944												
A8	US Lydia	SX 69523 60796	2	3	0	4	0	0	2	3	Poor	Poor	A	A
A9	DS Lydia	SX 69556 60578	16	0	7	2	3	0	19	0	Good	Absent	A	A
A10	DS Brent Island	SX 69399 60139	9	2	3	0	2	0	11	2	Fair	Poor	A	A
A11	Down-stream Gara Bridge	SX 73111 53089	4	1	2	1	0	8	4	1	Poor	Poor	P	A
A12	DS Lodd-iswell Bridge	SX 72661 48234	1	0	2	2	0	30	1	0	Poor	Absent	P	P
E1	Erme - US Ivy-bridge	SX 63653 56966	3	2	1	4	1	0	4	2	Poor	Poor	A	A