

South Cumbria Rivers Trust Electrofishing - 2018 Report



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A project funded by CaBA & Natural Course

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Introduction

As part of our monitoring programme South Cumbria Rivers Trust (SCRT) undertake annual catchment wide fish surveys using the electrofishing method. This enables assessment of juvenile salmonid (salmon and trout) populations and gathers some basic habitat information. The information gathered helps SCRT to monitor existing projects and identify sites for the delivery of new projects. It also supports the work of the Becks to Bay partnership; providing evidence for catchment planning and the development of funding bids to deliver work on the ground.

Fish populations are naturally extremely variable, both within rivers and through time, therefore individual surveys cannot provide statistically sound measures of spatial or temporal change. The results of the survey should be viewed at a catchment scale, particularly for migratory species such as salmonids. Salmonids are key indicators of freshwater health and general catchment condition, it is therefore important that we gather information on current trends.

Project Aims:

- i) Develop a robust scientific evidence base and on-going monitoring programme
- ii) Investigate the effectiveness of habitat improvement work
- iii) Assess trends in salmonid and other fish populations
- iv) Inform the Catchment Plans and support Water Framework Directive monitoring
- v) Share the data with the Becks to Bay partnership and wider public
- vi) Identify opportunities for future habitat improvement work
- vii) Assess future research requirements

This project aims to collect electrofishing data on a three-year rolling programme across the five catchments covered by South Cumbria Rivers Trust. This will enable the establishment of a baseline to be used in future electrofishing surveys. It will also be compared to both current and historic data from the Environment Agency. Our programme is run in conjunction with the Environment Agency's monitoring to ensure it complements and does not duplicate effort. The Environment Agency has undertaken fish surveys for a number of decades and now holds a large database of information. However, reductions in Agency staff numbers has meant that it is harder to maintain and update this database thus creating an evidence gap – South Cumbria Rivers Trust therefore continue to supplement these statutory surveys to maximise resources and share results. Therefore, each year SCRT is expanding their electrofishing programme to maximise coverage, and better understand the status of our catchments and fish populations, note due to external factors this has not been possible during 2018. Results are used to support the delivery of a number of actions by South Cumbria Rivers Trust and the Becks to Bay partnership. All survey results are made available online and shared with partners following completion.

One of the key aims of the Becks to Bay partnership is to provide robust evidence, innovation and monitoring with the objective to *'develop an evidence base, shared knowledge hub and on-going monitoring strategy to co-ordinate delivery of strategic projects, promote research and enhance innovation'*. By under-taking an extensive electrofishing monitoring programme, we are helping to establish an evidence base to monitor changes and trends across South Cumbria. This can then be used to target project activity and support funding applications to deliver more for the area of South Cumbria.



Methodology

Electrofishing Methodology

Electrofishing is a humane, non-lethal means of surveying fish populations. The technique applies an electric field in the watercourse which acts to cause taxis of the fish towards the operator and temporary incapacitation, thus rendering the fish easier to catch for bank-side analysis. At each site a E-fish 500W electrofishing back-pack was used to survey an unnetted, single pass of 50m. Sites were fished following a zigzag pattern in an upstream direction, ensuring continuous coverage of the riverbed through riffle and pool habitat. Prior to surveying, water quality parameters including temperature and conductivity were measured, this allowed the appropriate output from the e-fish backpack to be set (the e-fish backpack allows for the adjustment of outputs dependent on local site parameters). The output frequency on the backpack was set to 50hz at all sites to enable for the most effective and safe monitoring of salmonids. A minimum team of three to four people undertook the surveys, thereby allowing for one person to carry and operate the backpack and two people to use hand held nets and carry a bucket to hold the captured fish. A 'Semi-Quantitative' catch-per-area methodology, as described above with no stop-nets and only one pass of a 50m reach, was employed as this is the most resource efficient survey method enabling a maximised coverage of the catchment. It is also a recommended method in the UK TAG framework for Water Framework Directive monitoring. Semi-quantitative surveys can be calibrated against more detailed but more time and resource intensive quantitative surveys (Farooqi & Aprahamian, 1993), such as those undertaken by the Environment Agency. Quantitative surveys require four operatives, multiple passes, stop nets and generator driven bankside electrofishing equipment (Dugdale *et al.*, 2006).

Prior to calibration against quantitative surveys, semi-quantitative surveys will give a minimum density of fish present at each site. However, larger individuals of both fry and parr are more readily caught than smaller individuals and therefore data will be skewed towards larger sizes (Scottish Fisheries Coordination Centre, 2007).

Juvenile salmonids (salmon and trout parr and fry) are the focus of the surveys, which allow assessment of the size and age structure of populations. However, other fish species are recorded if caught; these include eels, bullhead, stone loach, minnow, lampreys and sticklebacks. Additionally, information about the river and surrounding habitat is recorded to give a more holistic picture; details such as vegetation cover, bed substrate, water depth and basic water chemistry, including conductivity and temperature, are noted. This can then be used to inform the development of habitat improvement projects for fish spawning.

Surveys in this report were undertaken in September 2018, under licence from the Environment Agency and with permissions from local landowners. Fry hatch from eggs spawned during the autumn and emerge out of gravels during April/ May; therefore, at the start of the survey season in July they are usually around 5-7cm in length. Parr are fish which are one year or older. Most salmon parr leave the river in the spring as smolts when they are around 12cm in length. Trout parr will either migrate down into the main river to become adult Brown Trout or undergo smoltification and move out to sea during the spring time as Sea Trout. Typically, juvenile salmon and trout spend between 1 and 3 years in freshwater before migrating to the sea as smolts. Fry and parr were caught and analysed on site. Numbers were recorded, and the length of each individual is measured to the fork in the tail, to the nearest 0.5cm. After they have been recorded fish are returned to the water unharmed. On rare



occasions, a very small number of fish do not withstand capturing without damage and unfortunately mortalities do occur. South Cumbria Rivers Trust keep records of fish mortalities during e-fish surveys and reviews allow assessments of surveyor technique. To date, fish mortalities have never exceeded 0.5% of the survey catches, there were no fish mortalities during the 2018 surveys.

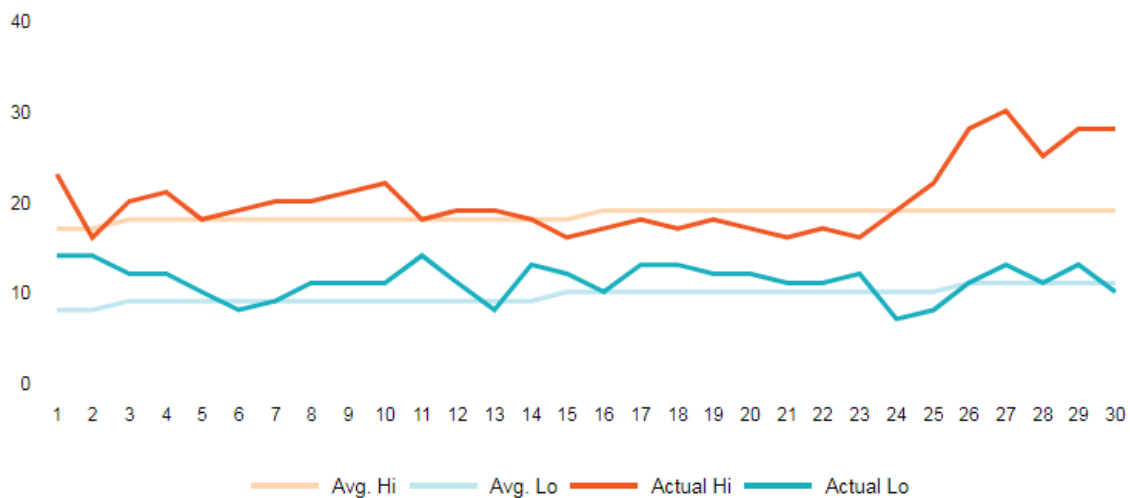
Within England and Wales it is an offence to electro-fish without an appropriate licence from the Environment Agency (EA). All licences from the EA and access permissions from riparian landowners and fisheries owners were gained and granted prior to surveying.

Site Selection

Fifty-seven sites were proposed across South Cumbria for survey during 2018, however, only 4 sites were surveyed. Due to low water levels and high-water temperatures during June and July (see figure 1 for air temperatures recorded at Windermere) the majority of fish surveys were put on hold or delayed until 2019. This was to avoid unnecessary stress to the fish and to ensure that any results were representative. The only sites which were surveyed during 2018 were on the River Bela. The River Bela, and its tributary Peasey Beck, is fed by water from Killington Reservoir and so maintains a fairly constant water level even during times of drought.

Please see Appendix I for the full list of proposed sites for 2018.

Temperature Graph June 2018



Temperature Graph July 2018

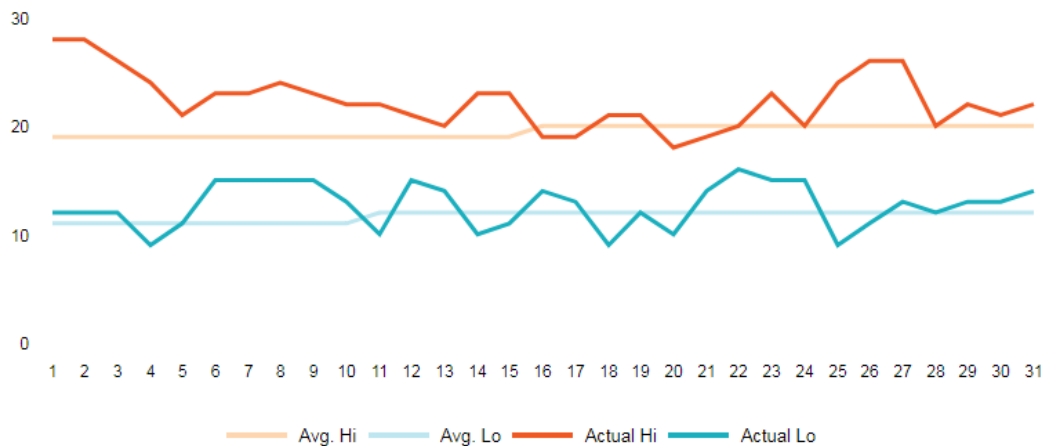


Figure 1. Air temperatures recorded at Windermere during June and July 2018, compared to average.¹

Results

Calculating the classification

The densities of salmon and trout were calculated and assigned a grade based on the National Fisheries Classification System (NFCS). The NFCS has been used by the Environment Agency to classify fish populations since 1997, following discussions with the Environment Agency our results have been calibrated and classified using the same method for direct comparison. This involves using a pre-calculated conversion factor to convert fish densities from semi-quantitative surveys to correspond to quantitative surveys (Farooqi & Aprahamian, 1993) and then assigning the values to one of 6 classes. The system splits the data into quintiles, such that the top 20% of sites from a given dataset are given a grade of A, the next 20% a grade of B and so on. There is also a class for 'no fish present'.

Fry and parr age classes are separated based on length abundance graphs; fish grow at different rates depending on the site conditions therefore it is not possible to assign one value for all sites. However, due to the low numbers of fish caught during 2018 length abundance graphs were difficult to determine and so a best estimate based on previous results was used.

During surveys, the presence and number of individuals of any other fish species caught are also recorded. Healthy fish populations depend not just on the abundance of fish but also the species diversity and the age structure of the population; therefore, we record all species and measure the length of the juvenile salmonids as a proxy for age. For example, bullhead and eels are not routinely surveyed during EA surveys and are not part of the classification scheme, therefore, only broad assumptions on presence/ absence can be deduced.

¹ Accu Weather (www.accuweather.com)



Table 1. Classification boundaries as provided by the Environment Agency

Salmonid abundance

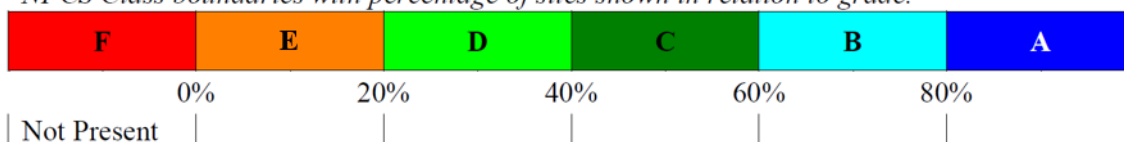
(Values are No. per 100m⁻²)

Species group	CLASS					
	A →	← B	← C	← D	← E	F
LEVEL ONE						
0+ Brown/sea trout	38	17	8	3		0
>0+ Brown trout	21	12	5	2		0
0+ Brown trout	86	45	23	9		0
>0+ Salmon	19	10	5	3		0
>0+ Rainbow trout	2	0.5	0.2	0.1		0
LEVEL TWO						
Brown/sea trout parr equivalents	47	28	15	6		0
Salmon parr equivalents	36	23	13	5		0
Total >0+ salmonids	31	18	11	4		0
>0+ Rainbow trout	2	0.5	0.2	0.1		0
LEVEL THREE						
Total salmonid parr equivalents	62	43	31	18		0

Table 2. National Fisheries Classification Scheme classes

Grade	Fish Density
A	Excellent
B	Good
C	Fair
D	Poor
E	Very Poor
F	No Fish Present

NFCS Class boundaries with percentage of sites shown in relation to grade.



Results

Due to the prolonged period of drought experienced in summer 2018 (June & July), fish surveys in South Cumbria were put on hold so as not to cause additional stress to the fish. However, towards the end of the season when the drought had abated 4 surveys were undertaken on the River Bela to support work by Milnthorpe Angling Association. Table 3 shows the results from these 4 surveys; this shows both the numbers of fry and parr caught, and following adjustment based on the calculations above, assigns them an NFCS category. Note, due to the very limited sample size it is difficult to determine age categories as there is no obvious age structure to the population.

Table 3 and supporting figures 1-2 show that salmonid populations at the 4 sites on the River Bela are not healthy; no site was classified higher than 'Very Poor' under the NFCS, with salmonids at different age categories being absent on a number of occasions. Habitat data collected during the surveys and reports from Milnthorpe Angling Association, show that there is variation habitat type, and river gravels would appear suitable for salmonid spawning.

Table 3. Number of fish caught per site during electrofishing surveys, with corresponding National Fisheries Classification Scheme category when adjusted for density

Site Name	No. Salmon Fry	NFCS	No. Salmon Parr	NFCS	No. Trout Fry	NFCS	No. Trout Parr	NFCS
Peasey Beck	1	E	0	F	0	F	0	F
Stainton Beck	0	F	0	F	0	F	0	F
The Oaks	0	F	0	F	1	E	2	E
Railway Bridge	2	E	2	E	1	E	0	F

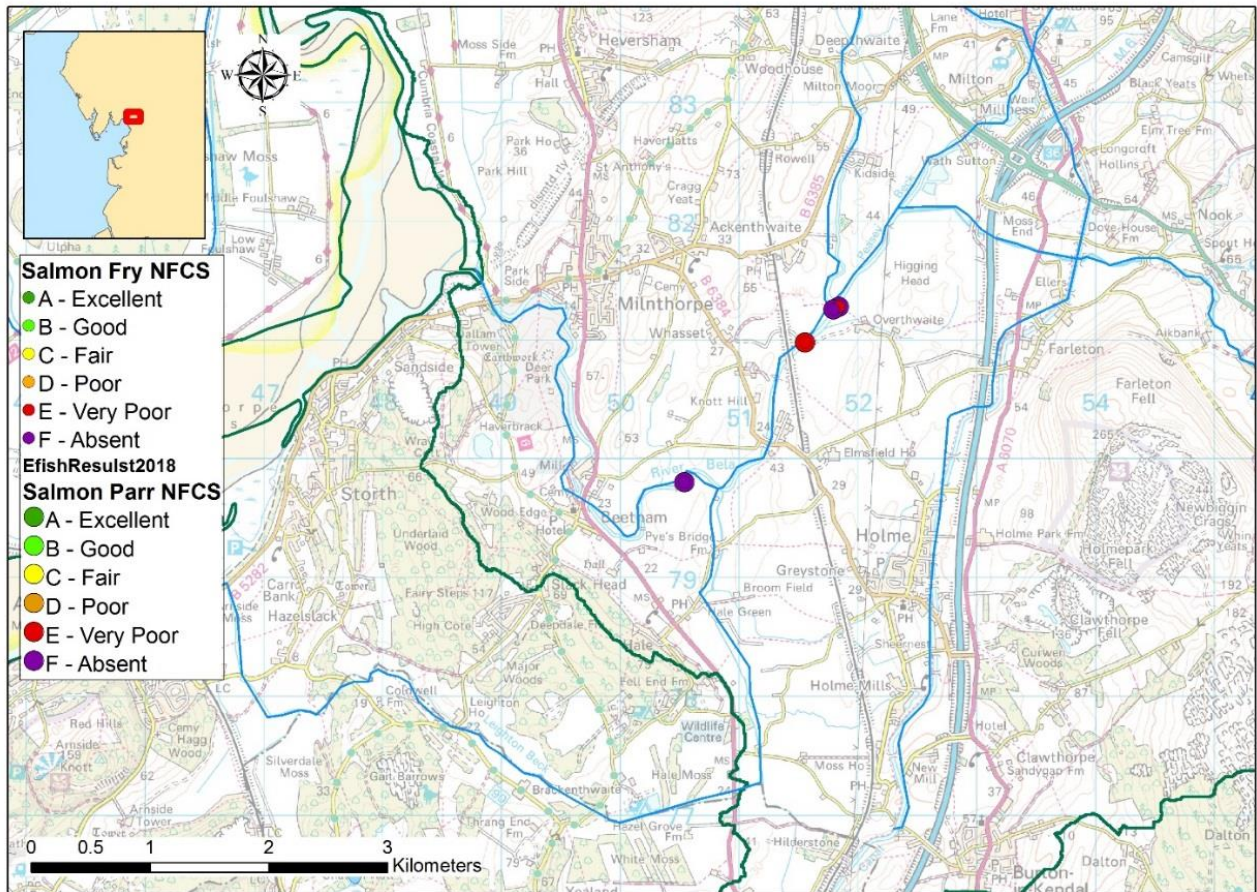


Figure 2. Salmon fry and parr results on the River Bela classified under the Environment Agency National Fisheries Classification Scheme.

The data presented above is from 2018 only and doesn't show any trends or patterns in fish populations. South Cumbria Rivers Trust have limited data on fish populations in the Bela catchment, however, surveys are compared to those undertaken by the Environment Agency. Figures 3 and 4 show the NFCS categories as determined by the Environment Agency during their surveys in 2018. Results for salmon fry and parr reflect those found during SCRT's surveys. However, Environment Agency results for trout fry and parr were more varied, particularly in the upper reaches of the catchment. On the other hand, only two sites out of the eight surveyed were classified as 'good' or higher for parr and three sites for fry, largely in the upper catchment. These results are reflected in the 2014 - 2016 surveys, see figures 6 – 7 for the 2016 results.



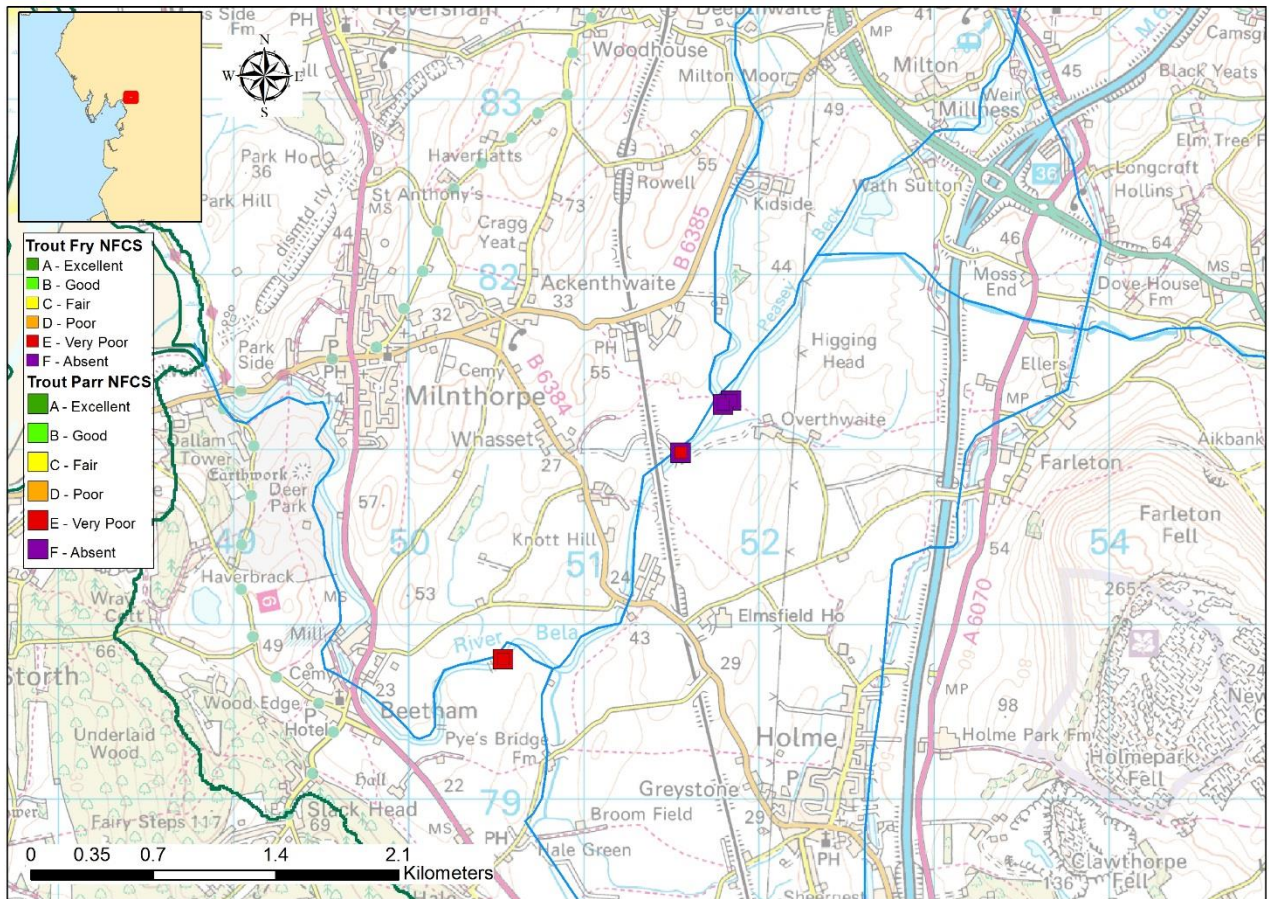


Figure 3. Trout fry and parr results on the River Bela classified under the Environment Agency National Fisheries Classification Scheme.

The Environment Agency also undertook surveys across other catchments in South Cumbria including the Duddon and Crake. Surveys reflect similar patterns as those seen on the Bela, with salmon fry and parr only being recorded at a small number of sites. Results for Trout populations are generally more positive with the majority of sites in the Duddon catchment recording at least fair for both fry and parr. The upper reaches of the Duddon also typically fall below trigger levels for the riverfly partnership, this is generally attributed to acidic background conditions.



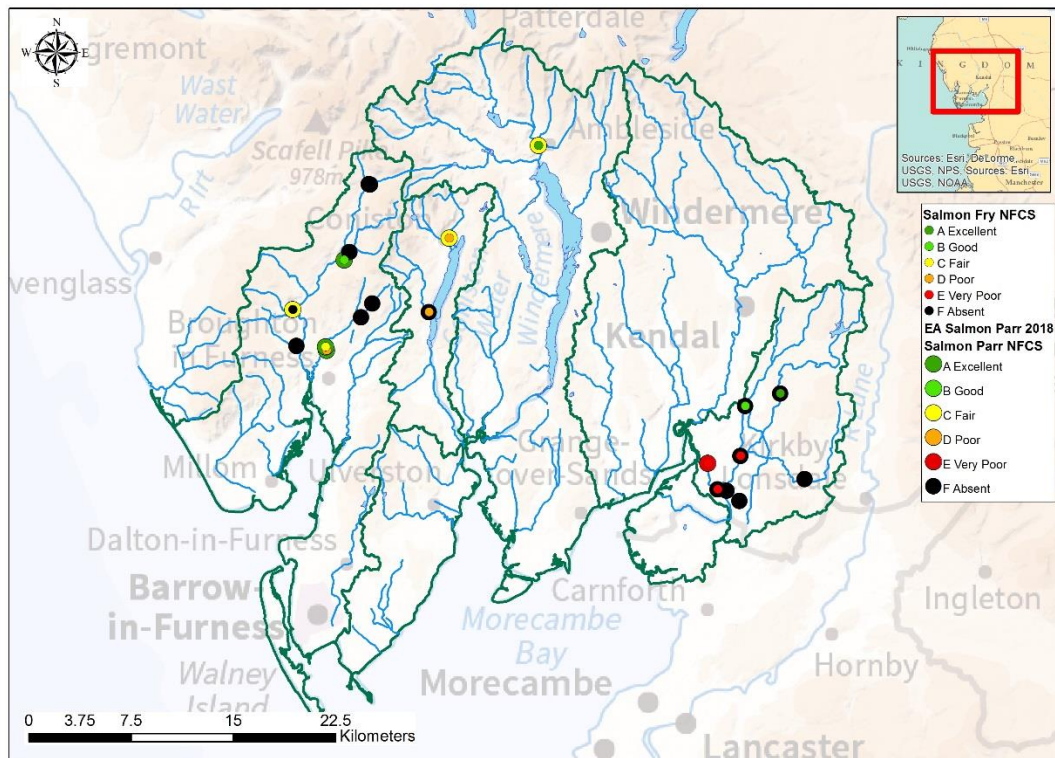


Figure 4. Environment Agency National Fisheries Classification for Salmon fry and parr in South Cumbria during 2018.

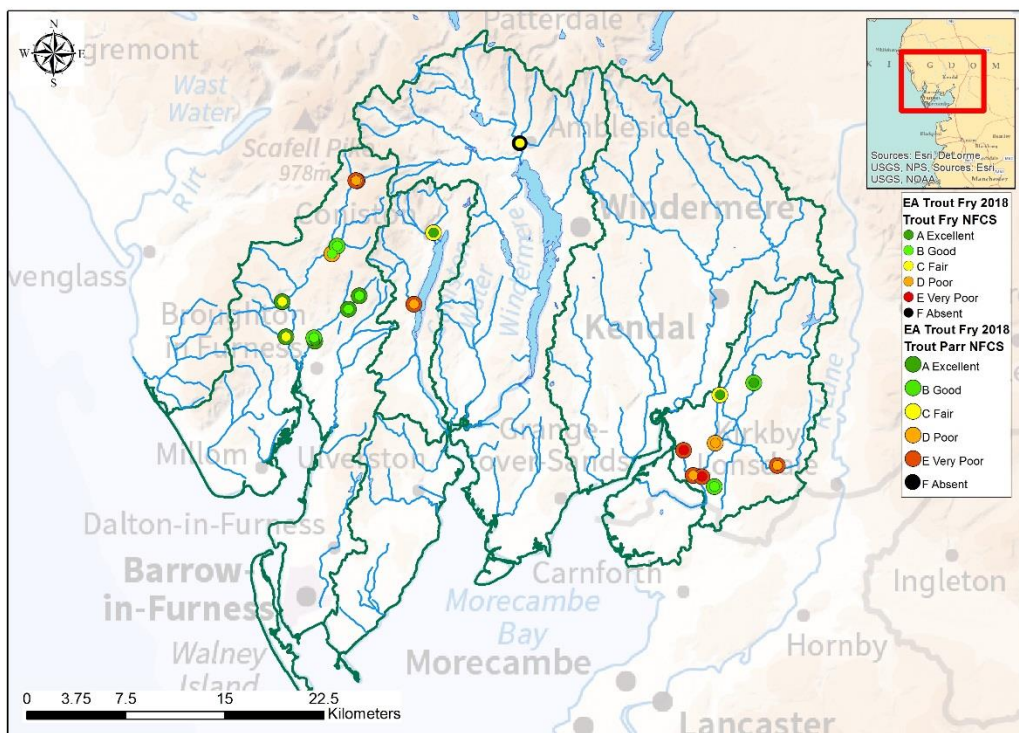


Figure 5. Environment Agency National Fisheries Classification for Trout fry and parr in South Cumbria during 2018.



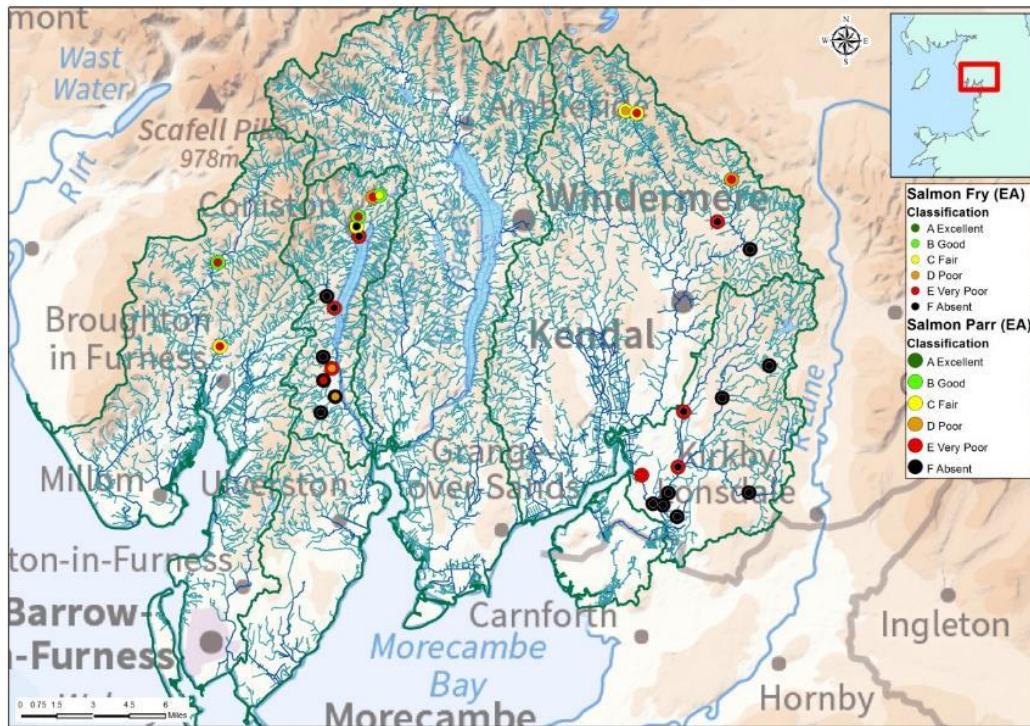


Figure 6. Environment Agency National Fisheries Classification for Salmon fry and parr during the 2016 surveys.

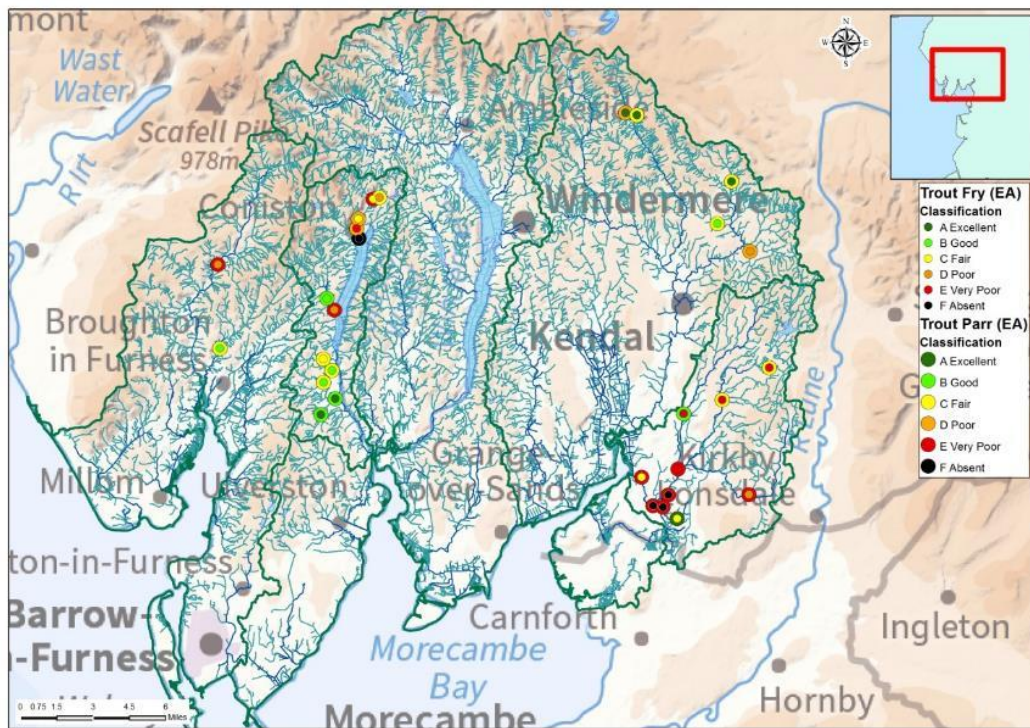


Figure 7. Environment Agency National Fisheries Classification for trout fry and parr during the 2016 surveys



Next Steps for 2019

Results from the 2018 surveys give rise to concern for fish populations and also catchment health; therefore during 2019 further surveys will be undertaken in the Bela catchment to investigate this and record the changes in fish populations, particularly in the upper catchment as well as lower reaches. Ideally this would also be supported by investigations into water quality and wider catchment assessments. This will help to understand the wider picture and develop potential actions to improve and support fish populations in the future.

Proposed sites to survey in 2019 across the whole of South Cumbria will be reviewed to include those sites not surveyed during 2018 and any which support project work undertaken by the Trust.

Acknowledgements

South Cumbria Rivers Trust would like to thank Milnthorpe Angling Association for their support with the electrofishing surveys. Our thanks are also extended to Dallam Estates for their kind permission to undertake the surveys on their land.

References

Dugdale, L.J., Brown, J, Lane, S.N., & Maltby, A. 2006. Rapid Assessment of River Environments. http://www.therivertrust.org/environment/downloads/appx_46_rare.pdf

Farooqi M.A. & Aprahamian M.W. 1993. The Calibration of a Semi-Quantitative Approach to Fish Stock Assessment in the North West Region of the NRA. Environment Agency, Ghyll Mount, Penrith.

Scottish Fisheries Co-ordination Centre, 2007. Fisheries Management SVQ Level 3: Manage Electrofishing Operations, Inverness College.



Appendices

Appendix I

Table of sites proposed for survey in 2018. Those in bold were surveyed during 2018.

Site No.	Site Name	Catchment	Limit	NGR	SSSI
1	Black Hall Beck	Duddon	Upstream	NY24048 01247	No
			Downstream	NY24086 01122	
2	Troutal Beck	Duddon	Upstream	SD23606 98744	No
			Downstream	SD23396 98594	
3	Long House Gill	Duddon	Upstream	SD23713 97339	No
			Downstream	SD23365 97272	
4	Quarry Gutter	Duddon	Upstream	SD23644 96498	No
			Downstream	SD23135 96442	
5	Rake Beck	Duddon	Upstream	SD22193 95782	No
			Downstream	SD21678 95952	
6	Blea Beck	Duddon	Upstream	SD19241 92055	No
			Downstream	SD19457 92046	
7	Kirkby Pool @ High Cross	Duddon	Upstream	SD24639 88563	No
			Downstream	SD24567 88257	
8	Kirkby Pool @ Steers Pool	Duddon	Upstream	SD24452 90437	No
			Downstream	SD24280 89834	
9	Gill House Beck @ Soutergate	Duddon	Upstream	SD23292 82026	No
			Downstream	SD22748 81421	
10	Croglinhurst Bridge	Duddon (Lickle)	Upstream	SD21545 90158	No
			Downstream	SD21467 89641	
11	Whitcham Beck (1)	Duddon	Upstream	SD16562 85195	No
			Downstream	SD16135 84530	
12	Whitcham Beck @ Po House Chapel	Duddon	Upstream	SD14814 82715	No
			Downstream	SD14245 82017	
12 b	Whitcham Beck @ Haverigg Pool	Duddon	Upstream	SD13918 80440	No
			Downstream	SD13463 80962	
13	Sarah Beck	Leven	Upstream	SD24059 68695	No
			Downstream	SD25387 67435	
14	Mill/Poaka Beck	Leven	Upstream	SD22016 72605	No
			Downstream	SD22028 71651	
15	Gleaston Beck	Leven	Upstream	SD26025 71093	No
			Downstream	SD25943 70767	
16	Grizedale Beck @ Low Bowkerstead	Leven	Upstream	SD33663 92252	No
			Downstream	SD33818 91226	



Site No.	Site Name	Catchment	Limit	NGR	SSSI
17	Ashes Beck: Rusland Pool	Leven	Upstream	SD33530 89279	No
			Downstream	SD22861 88593	
18	Dale Park Beck	Leven	Upstream	SD35302 93227	No
			Downstream	SD35213 92843	
19	Colwith Bridge, Little Langdale	Leven	Upstream	NY33178 03053	No
			Downstream	NY33312 03472	
20	High Birk Howe, Little Langdale	Leven	Upstream	NY31603 02876	No
			Downstream	NY31817 03128	
21	River Brathay @ Skelwith	Leven	Upstream	NY34455 03376	No
			Downstream	NY34593 03422	
22	River Rothay @ Tongue Gill	Leven	Upstream	NY33561 09106	No
			Downstream	NY33408 09129	
23	Blake Beck near Skelwith	Leven	Upstream	NY35613 02987	No
			Downstream	NY36471 02307	
24	Troutbeck @ Limefitt	Leven	Upstream	NY41585 03693	No
			Downstream	NY41493 03161	
25	Bell Beck, Troutbeck	Leven	Upstream	NY40820 00651	No
			Downstream	NY40468 00255	
26	Miller Beck - Lower	Leven	Upstream	SD37717 85443	No
			Downstream	SD37246 85900	
27	Miller Beck - Upper	Leven	Upstream	SD37152 84104	No
			Downstream	SD37724 84773	
28	Newlands Beck near Newland Bottom	Leven	Upstream	SD29289 80595	No
			Downstream	SD30086 79824	
29	Newlands Beck near Bowstead gates	Leven	Upstream	SD29251 81213	No
			Downstream	SD29286 80712	
30	Pennington Beck	Leven	Upstream	SD26561 77523	No
			Downstream	SD26040 77390	
31	Cunsey Beck	Leven	Upstream	SD36929 94079	No
			Downstream	SD38099 93573	
32	Hall Beck	Leven	Upstream	SD34464 99973	No
			Downstream	SD34500 99796	
33	Black Beck Near Hawkshead	Leven	Upstream	SD34816 98493	No
			Downstream	SD35089 98666	
34	Dubbs Beck	Kent	Upstream	NY42281 01428	Yes
			Downstream	NY42382 01210	
35	Browfoot	Kent	Upstream	NY45647 00981	Yes
			Downstream	NY45812 00590	
36	Kent near Staveley	Kent	Upstream	SD47859 97830	Yes
			Downstream	SD47951 97881	
37	Bannisdale Upper	Kent	Upstream	NY51480 04205	Yes
			Downstream	NY51664 03340	



Site No.	Site Name	Catchment	Limit	NGR	SSSI
38	Bannisdale Lower	Kent	Upstream	NY52733 02280	Yes
			Downstream	NY53166 01729	
39	Yewtree Upper	Crake	Upstream	NY32691 01227	No
			Downstream	NY32387 00793	
40	Yewtree Lower	Crake	Upstream	NY31259 00199	No
			Downstream	SD31626 99715	
41	Hoathwaite Beck	Crake	Upstream Downstream	SD30014 95332 SD30278 95336	No
42	Sunny Bank Mill	Crake	Upstream	SD30278 95336	No
			Downstream	SD29095 92273	
43	Park Ground, Torver	Crake	Upstream	SD28519 93606	No
			Downstream	SD28591 93353	
44	Colton Beck @ Bandrake Head	Crake/ Colton	Upstream	SD30954 88325	No
			Downstream	SD31055 87133	
45	Greenholme Beck - Upper	Crake	Upstream	SD28177 89173	No
			Downstream	SD28301 89141	
46	Greenholme Beck - Lower	Crake	Upstream	SD28604 89101	No
			Downstream	SD28784 89104	
47	Smithy Beck	Crake	Upstream	SD27511 87113	No
			Downstream	SD27921 87297	
48	Langholme Beck	Crake	Upstream	SD29017 86377	No
			Downstream	SD29120 86544	
49	Ellers Meadow <i>Actual site surveyed: SD50527 79802</i>	Bela	Upstream	SD49688 79693	No
			Downstream	SD49636 80298	
50	Hang Bridge	Bela	Upstream	SD51277 80500	No
			Downstream	SD51142 79969	
51	Burnside Farm	Bela	Upstream	SD52095 78696	No
			Downstream	SD51584 78462	
52	Badger Gate	Bela	Upstream	SD56465 80170	No
			Downstream	SD5679780024	
53	Overthwaite	Bela	Upstream	SD51942 81478	No
			Downstream	SD51331 80737	
54	Rowell Bridge	Bela	Upstream	SD51901 83138	No
			Downstream	SD51959 82574	
55	Winster near Wood Farm	Winster & Gilpin	Upstream	SD41283 91642	No
			Downstream	SD41000 91181	
56	Arndale Beck near High Birks	Winster & Gilpin	Upstream	SD42354 90516	No
			Downstream	SD42564 90370	
57	River Gilpin near Ellerbank Farm	Winster & Gilpin	Upstream	SD46291 94776	No
			Downstream	SD46364 94251	





South Cumbria Rivers Trust is registered in England and Wales as a company limited by guarantee (Company No: 5763380) and a charity (Charity No: 1114682). We established in 2000 with the aim to protect, conserve and rehabilitate the aquatic environments of South Cumbria.

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