

South Cumbria Rivers Trust Electrofishing - 2020 Report



A project funded by DEFRA under the
Catchment Based Approach



South Cumbria Rivers Trust is registered in England and Wales as a company limited by guarantee.
Company Registration No: 5763380. It is also a registered Charity: No 1114682
Head Office: The Clock Tower Business Centre, Low Wood, Ulverston, Cumbria. LA12 8LY.



Contractor

This document was produced by South Cumbria Rivers Trust
Jayne Wilkinson: Catchment Planning and Monitoring Officer
The Clock Tower Business Centre, Low Wood, Ulverston, LA12 8LY

Project Funders

This project was funded by DEFRA under the Catchment Based Approach.

Disclaimer

Whilst this document is considered to represent the best available scientific information and expert opinion available at the stage of completion of the report, it does not necessarily represent the final or policy positions of the project funders or contractors.

Dissemination status

Unrestricted

SCRT Project Manager

SCRT's project manager for this contract was:

Report completed and signed off

Name: Rebecca Corrie-Close

Signature:

Position: Team Manager

Date: 19/1/21



SCRT Project Code

10-019-19

South Cumbria Rivers Trust
The Clock Tower Business Centre
Low Wood, Ulverston,
Cumbria.
LA12 8LY

Website: www.scrt.co.uk
Email: info@scrt.co.uk
Telephone: 01539 530047

Registered Charity No: 1114682

Company Limited by Guarantee No: 5763380



Table of Contents

1.	Introduction.....	5
2.	Project Aims	5
3.	Methodology	6
3.1	Electrofishing Methodology.....	6
3.2	Site Selection.....	7
3.3	Calculating the classification.....	8
4.	Results	10
4.1	Overview	10
4.2	Duddon.....	14
4.3	Coniston & Crake	14
4.4	Windermere & Leven	15
4.5	Kent & Winster.....	15
4.6	Bela.....	16
4.7	Minor Catchments	16
4.8	Environment Agency Classifications	17
4.9	Sources of Error.....	17
5.	Historic Data.....	18
6.	The National Picture.....	18
7.	Other Species.....	20
6.1	European eel	21
6.2	Bullhead	21
6.3	Lamprey	22
8.	Next Steps for 2021	22
9.	Acknowledgements	22
10.	References	23
Appendix I		24
	Raw data and national fisheries classification classes by site for electrofishing surveys in 2020. ...	24
	Densities of all fish species caught during the fish surveys. Note these are from semi-quantitative surveys and have not been converted to quantitative.....	25

Table of Figures

Figure 1. Sites where fish surveys were undertaken by South Cumbria Rivers Trust during 2020.....	11
Figure 2. Salmon fry abundance as classified under the National Fisheries Classification Scheme (NFCS) at sites surveyed across South Cumbria in 2020.	11
Figure 3. Salmon parr abundance as classified under the National Fisheries Classification Scheme (NFCS) for sites surveyed across South Cumbria in 2020.....	12
Figure 4. Trout fry abundance as classified under the National Fisheries Classification Scheme (NFCS) for sites surveyed across South Cumbria in 2020.....	12
Figure 5. Trout parr abundance as classified under the National Fisheries Classification Scheme (NFCS) for sites surveyed across South Cumbria in 2020.....	13
Figure 6. Potential barriers to fish migration across South Cumbria.....	13
Figure 7. Section of new beck at Greenholme	14
Figure 8. Weir on Farra Grain Gill prior to removal in September 2020.	15
Figure 9. Straightened section of St Sundays beck, on the Bela, which is proposed for future restoration.	16
Figure 10. Juvenile salmon abundance indices for each catchment, presented as a percentage of surveys in classes A to C only (2014 - 2019). Credit: CEFAS, 2019.	19
Figure 11. Abundance of all fish species recorded during 2020 electrofishing surveys. Note this has been adjusted for density however it has not been adjusted to take into account that these were semi-qualitative surveys.....	20
Figure 12. Abundance of all fish species recorded during 2020 electrofishing surveys (excluding Peasey Beck). Note this has been adjusted for density however it has not been adjusted to take into account that these were semi-qualitative surveys.....	21

1. Introduction

South Cumbria Rivers Trust (SCRT) undertake annual fish surveys across South Cumbria using the electrofishing method. This is an important assessment of juvenile salmonid (salmon and trout) populations to help understand trends over time and help quantify the impacts of projects. Alongside this it also gathers basic habitat information and is an important engagement tool for people who are interested in learning more about their local becks. Salmonids are key indicators of freshwater health and general catchment functioning. Therefore, this monitoring provides evidence for catchment planning, data to support current projects and is used to inform the development of funding bids to deliver work on the ground. This information is used by the Becks to Bay catchment partnership and other local organisations such as the Environment Agency.

2. Project Aims

- Develop a robust scientific evidence base and on-going monitoring programme
- Investigate the effectiveness of habitat improvement work
- Assess trends in salmonid populations
- Inform the catchment plans and support Water Framework Directive monitoring
- Share data with the Becks to Bay partnership and wider public
- Identify opportunities for future habitat improvement work
- Engage public and partners with the issues facing our rivers

The project aims to undertake fish surveys on a three-year rolling programme across the five catchments covered by South Cumbria Rivers Trust. This will help to establish a baseline and monitor trends over time. Additionally, part of the programme is designed to enable project sites to be monitored over consecutive years to assess the effectiveness of interventions. However, fish populations are naturally extremely variable, both within rivers and through time, therefore individual surveys should be viewed at a catchment scale, particularly for migratory species such as salmonids.

The programme is run in conjunction with the Environment Agency's monitoring to ensure they are complimentary and do not duplicate effort. The Environment Agency has undertaken fish surveys for several decades and hold a large database of information which is accessible to SCRT. However, over recent years there has been less resource for monitoring, creating an evidence gap which SCRT aim to fill. SCRT have now been running an established electrofishing programme since 2016. Due to limited resource some surveys were undertaken prior to this, however these were on a smaller scale and not in the current programme format. Although SCRT have some records running back to 2011. During 2020 the coronavirus



pandemic halted some activity for the trust and in other cases additional measures had to be put in place to ensure the safety of staff and volunteers, despite this the trust still managed to undertake a number of surveys to continue to gather data and evidence on the status of fish populations across South Cumbria.

3. Methodology

3.1 Electrofishing Methodology

Electrofishing is a humane, non-lethal means of surveying fish populations. The technique applies a small electric current to the watercourse which acts to cause temporary incapacitation and taxis of the fish towards the operator, thus rendering the fish easier to catch for bankside analysis. At each site an E-fish 500W electrofishing back-pack was used to survey an un-netted 50m reach using a single pass. Sites were fished following a zigzag pattern in a upstream direction, ensuring continuous coverage of the riverbed. Prior to surveying, water quality parameters, including temperature and conductivity were measured. This enabled adjustment of the E-fish backpack to the appropriate settings for each site, to ensure the safety and wellbeing of the fish and operators. The output frequency on the backpack was set to 50hz at all sites as this is the most effective and safe setting for salmonids, ensuring the data is comparable. A team consisting of a minimum of three people at each site undertook each survey, one operating the backpack and two people netting the fish using hand held nets. The method used is semi-quantitative as no stop nets are employed and there is only a single pass of the reach. Therefore, it is inevitable that some fish are missed during the survey; this is accounted for when calculating the results. Semi-quantitative surveys can be calibrated against the more detailed but more time and resource intensive quantitative surveys (Farooqi & Aprahamian, 1993). The semi-quantitative method is the most resource efficient method, maximizing coverage across the catchment. This is also the recommended method in the UK TAG framework for Water Framework Directive monitoring.

Juvenile salmonids are the focus of the surveys. By recording the species and length we can gain an assessment of the size and age structure of the populations. Other fish species are recorded, but not measured; these include eels, bullhead, stone loach, minnow, lampreys and sticklebacks. Further information on the river and surrounding habitat is also recorded to gain a more holistic picture. This includes details such as vegetation cover, bed substrate, water depth and basic water chemistry. This can then be used to inform the development of habitat improvement projects for fish spawning.

Surveys in this report are undertaken between July and September 2020. They are restricted to this timeframe so as not to disturb fish spawning and are only permitted under licence from the Environment Agency and with permissions from local landowners. Surveys record salmonid fry and parr, which are caught and analysed on site. Fry hatch from eggs spawned in the autumn and then emerge out of gravels during April/ May. Parr are fish which are one year or older; most salmon parr leave the river in spring as smolts when they are around 12cm in length. Trout parr will either migrate down into the main river to become brown trout or

undergo smoltification and move out to sea as sea trout. Typically, juvenile salmon and trout spend between 1 and 3 years in freshwater before migrating to the sea as smolts. During the surveys the number of fish are recorded and the length of each individual is measured to the fork in the tail (to the nearest 0.5cm). All fish are then returned to the water, unharmed. On rare occasions, a very small number of fish do not withstand the process and unfortunately mortalities do occur. South Cumbria Rivers Trust keeps a record of fish mortalities, and this is reviewed to allow assessments of methods and surveyor technique. To date, fish mortalities have never exceeded 0.5% of the survey catches.

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 permission from riparian landowners and fisheries owners were gained and granted prior to surveying.

3.2 Site Selection

During 2020 SCRT were granted a permit from the EA to undertake surveys across South Cumbria. A programme of sites was established prior to the electrofishing season to incorporate project specific sites and 'generic' baseline sites. Due to the coronavirus pandemic this year sites were selected on a priority basis, generally deemed to be those where project work had been undertaken, and where logistics made it feasible, such as those sites with easy access where we were able to park three cars (due to being unable to share transport).

Table 1. Full list of sites electro-fished by SCRT across South Cumbria in 2020.

No.	Site Name	Catchment	Grid Reference
1	Bela at Railway Bridge	Bela	SD51669 81051
2	Peasey Beck	Bela	SD51825 81264
3	St Sundays - Upper	Bela	SD55042 89637
4	St Sundays - Woodland	Bela	SD54187 88452
5	Greenholme Lower	Crake	SD28687 89082
6	Greenholme Upper	Crake	SD28570 89124
7	Langholme Beck	Crake	SD29081 86467
8	Yewdale Beck	Crake	SD31834 99765
9	Yewtree Beck	Crake	SD31590 99820
10	Gil Banks - Lower	Furness	SD28238 79226
11	Gill Banks - Upper	Furness	SD28238 79226
12	Pennington Beck	Furness	SD25777 77869
13	Poaka Beck	Furness	SD22177 73402
14	Farra Grain Gill	Minor Catchments	SD33367 92444
15	Leighton Beck	Minor Catchments	SD48453 77906
16	Newlands at Broughton	Minor Catchments	SD28514 82264
17	Newlands Beck	Minor Catchments	SD29987 79789
18	Spannel Beck	Winster & Gilpin	SD41572 86948
19	Wood Farm	Winster & Gilpin	SD41066 91273

3.3 Calculating the classification

Electrofishing surveys provide data on the number of fish present within a reach, this can then be converted to a density of fish. Once the density of salmonids per 100m² has been obtained each site can be graded based on the National Fisheries Classification Scheme (NFCS). This scheme has been used by the Environment Agency to classify fish populations since 1997. Following discussions with the Environment Agency the results obtained here have been calibrated and classified using the same method. This involves using a pre-calculated conversion factor to make the fish densities obtained from semi-quantitative surveys comparable to those generated from quantitative surveys (Farooqi & Aprhamian, 1993). These values can then be assigned to one of 6 classes; 5 classes based on quintiles and 1 one for absent see Table 2. These are absolute classifications meaning they aren't related to sites with a similar habitat but rather are related to all sites and therefore they only give a broad indication. Prior to calibration against quantitative surveys, semi-quantitative surveys will give a minimum density of fish present at each site. Converting these values to the national system allows for comparison of abundance over a wider geographical area.

Salmonid fry and parr classes were separated based on fish sizes deduced from length abundance graphs. Fish grow at different rates depending on the site conditions, it is therefore difficult to assign one value for all sites. At sites where only a small density of fish are caught it can be difficult to determine the break in age categories, therefore a best estimate based on nearby sites is made.

During surveys, the number of individuals of any other fish species caught are also recorded. These species are not routinely surveyed by the Environment Agency and do not form part of the classification scheme, therefore only broad assumptions on presence/ absence can be deduced. Furthermore, the E-fish backpack is set to be most effective for salmonids and therefore numbers of other species caught may not be entirely representative.

Table 1. Classification boundaries as provided by the Environment Agency

Salmonid abundance

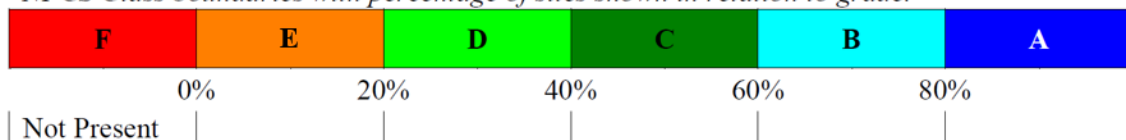
(Values are No. per 100m⁻²)

Species group	CLASS					F
	A →	← B →	← C →	← D →	← E	
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.



4. Results

4.1 Overview

During 2020 a total of 19 sites were surveyed, see Figure 1. Surveys were successfully undertaken across a number of catchments and at a number of sites which had been a priority for several years but for which the trust had never managed to successfully survey, including Leighton Beck and some of the becks in the Furness peninsula. However, poor weather contributed to high water levels for large parts of the survey season restricting the number of sites which could be surveyed with surveys being cancelled on several occasions. Figures 2 to 5 show the national fisheries classifications at each site for salmon and trout fry and parr, the raw data can also be viewed in Appendix 1.

The presence of European Eel, *Anguilla Anguilla*, and lamprey, *Lampetra planeri*, at a number of sites during 2020 was positively noted; both of these species do not form part of the National Fisheries Classification Scheme and so there are no definitive classes. However, given the European eel has declined by 90-95% in the last 45 years (three generations), and are now classified as critically endangered according to the IUCN red list (Jacoby & Gollock, 2014), the record of this species across a number of surveys is positive. Furthermore, it was observed that these seemed to be relatively higher compared to surveys in previous years.

The Coniston and Crake catchment was the only one surveyed during 2020 where salmon were recorded. Other areas, such as the Furness peninsula, are often hindered by barriers to migration and a lack of habitat; future projects are hoping to address these issues. It should be noted that surveys were not undertaken in the Kent and Duddon catchments, and these will be prioritised for 2021; salmon have been recorded in both of these catchments in previous years. Figure 6 shows the potential barriers to migration, in some cases there are natural barriers to migration such as waterfalls, however, in a number of instances these barriers are man-made and are impacting migratory species, making it harder for them to reach their spawning grounds in the upper parts of catchments. Furthermore, all results and comparisons should be viewed with a degree of caution as there are several potential sources of error which are discussed further in section 4.8.

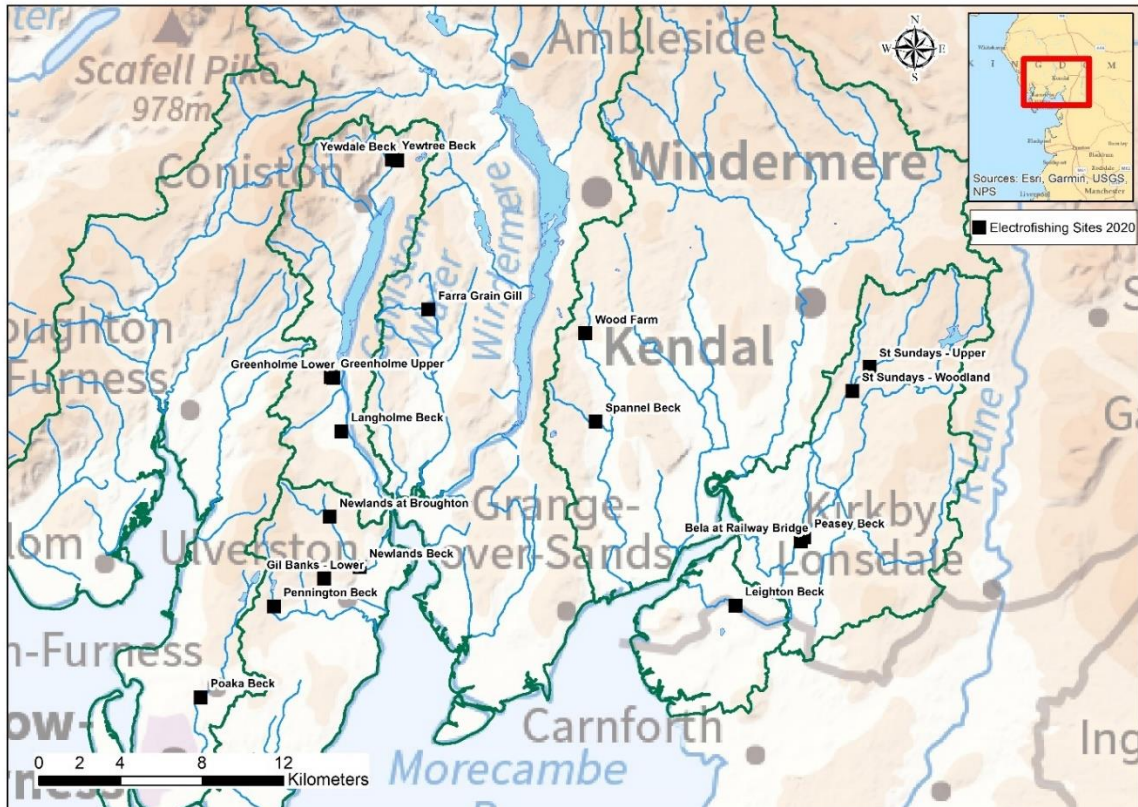


Figure 1. Sites where fish surveys were undertaken by South Cumbria Rivers Trust during 2020.

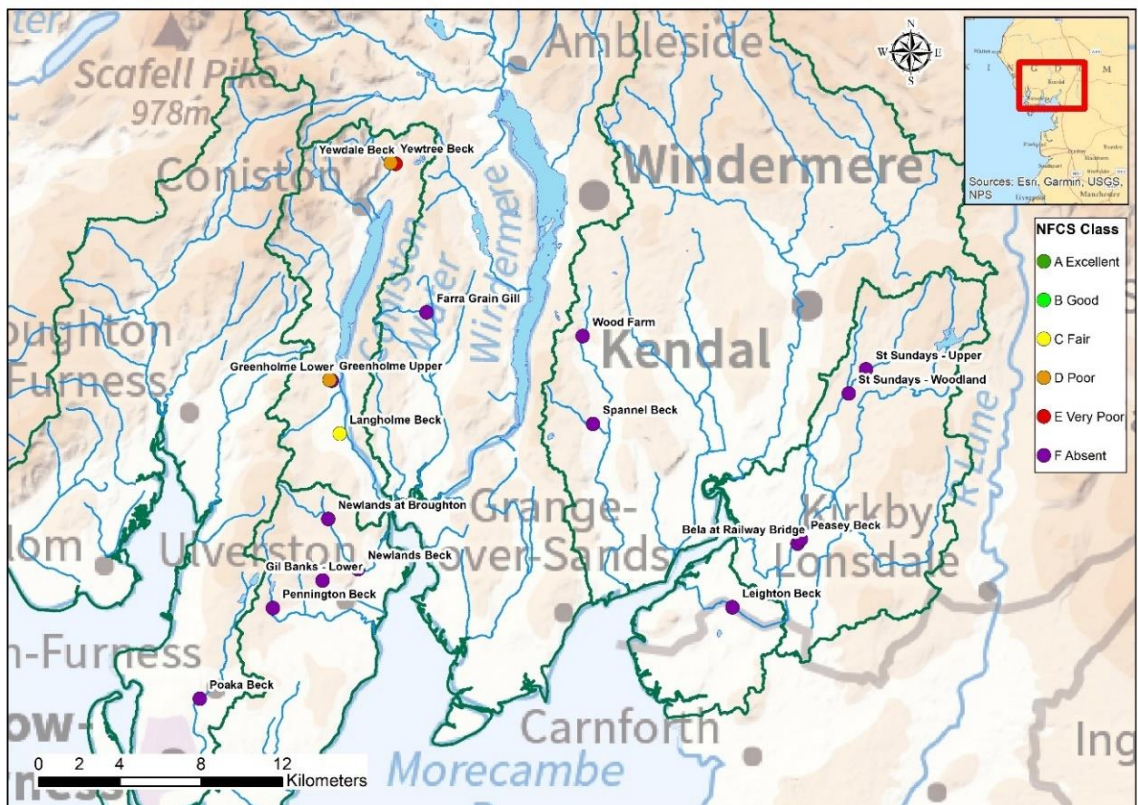


Figure 2. Salmon fry abundance as classified under the National Fisheries Classification Scheme (NFCS) at sites surveyed across South Cumbria in 2020.

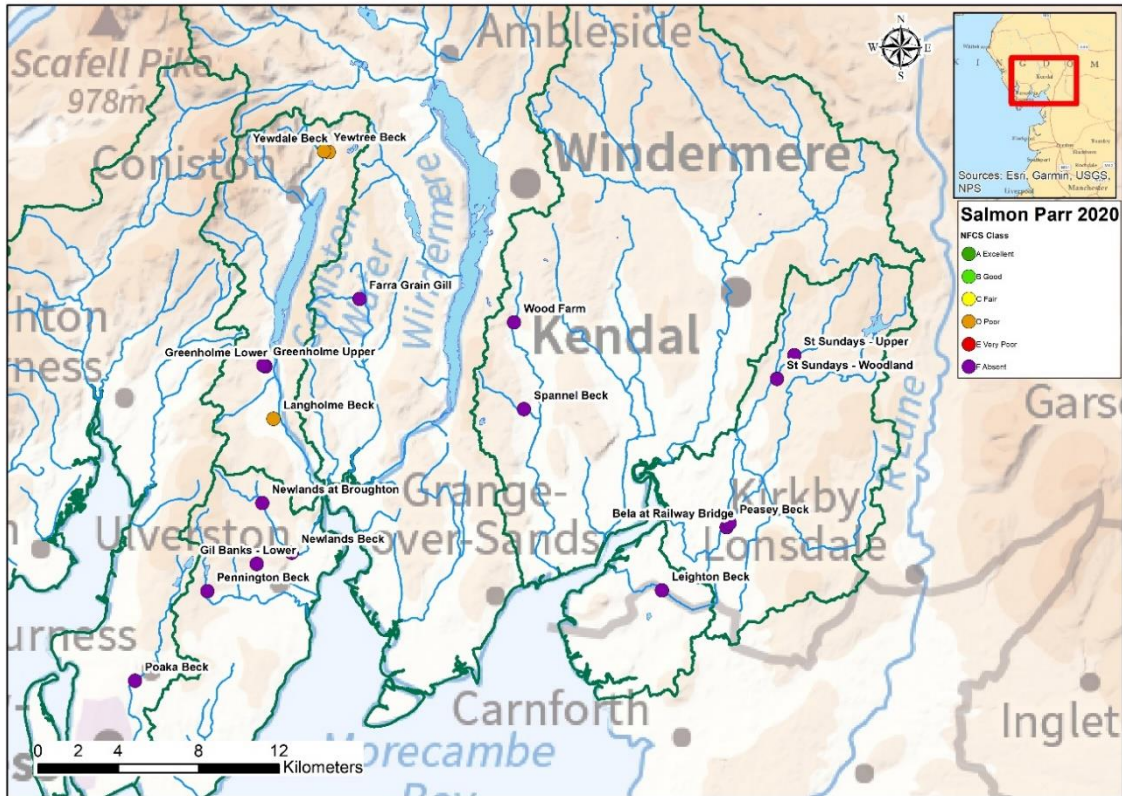


Figure 3. Salmon parr abundance as classified under the National Fisheries Classification Scheme (NFCS) for sites surveyed across South Cumbria in 2020.

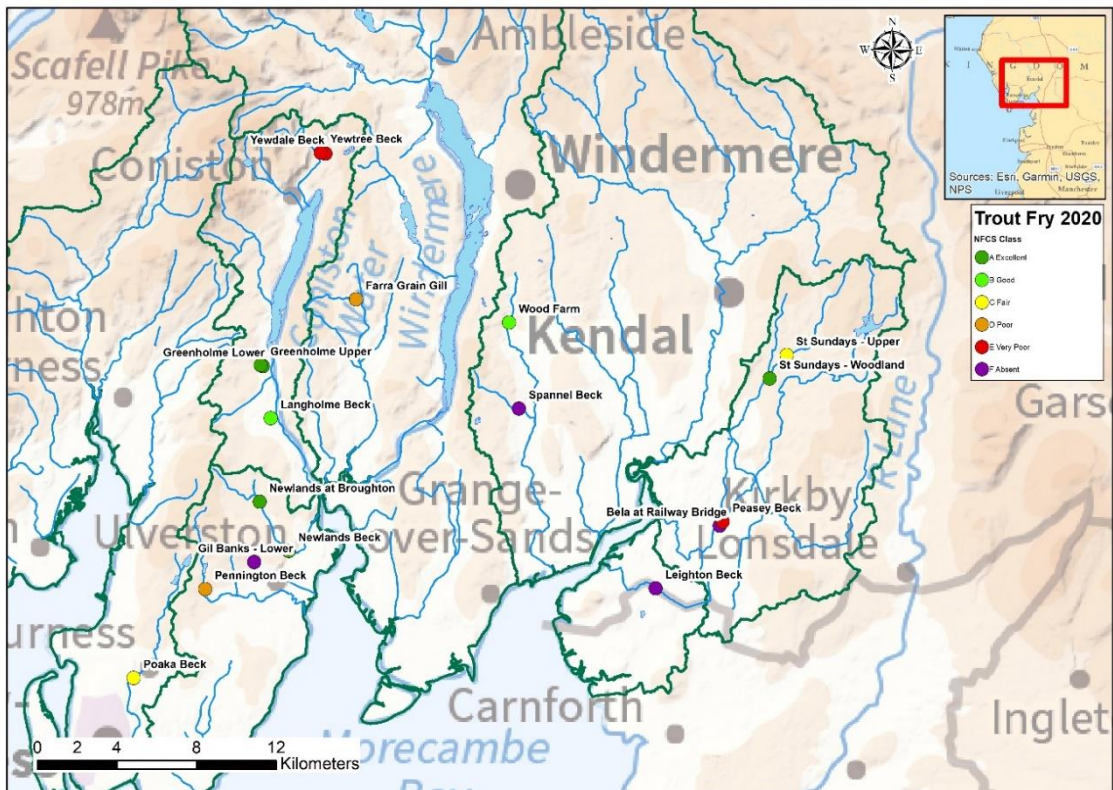


Figure 4. Trout fry abundance as classified under the National Fisheries Classification Scheme (NFCS) for sites surveyed across South Cumbria in 2020.

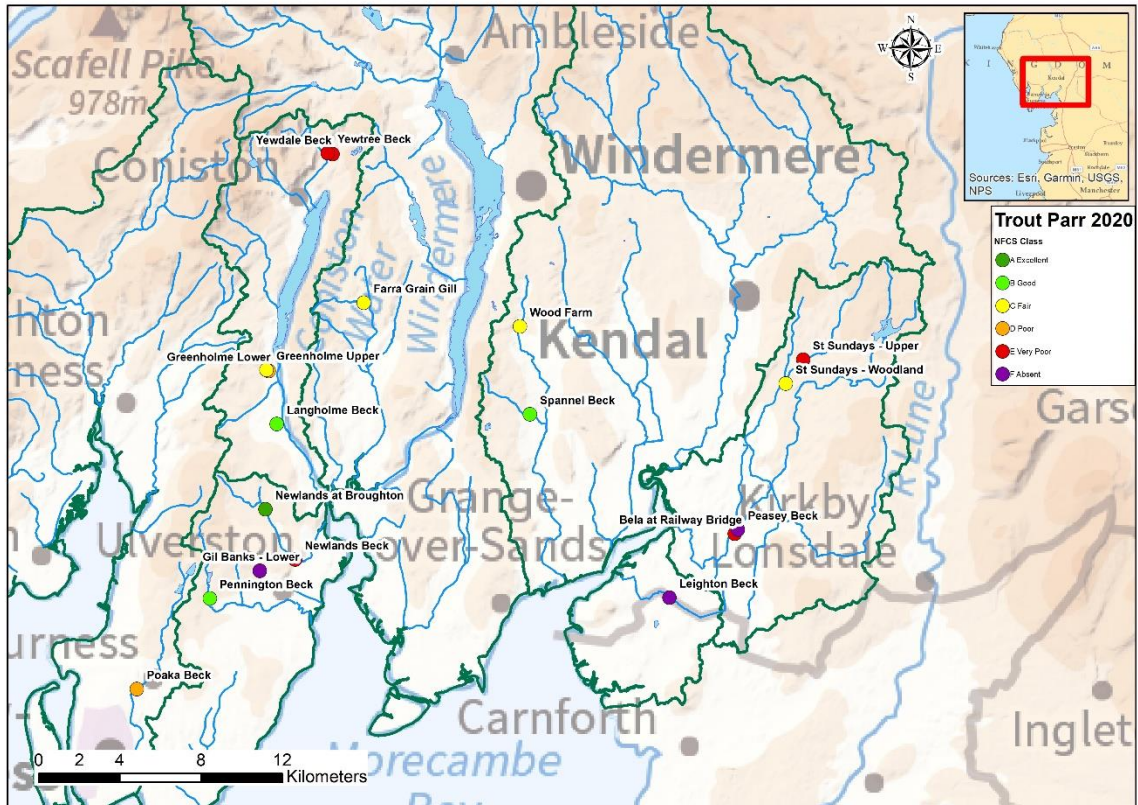


Figure 5. Trout parr abundance as classified under the National Fisheries Classification Scheme (NFCS) for sites surveyed across South Cumbria in 2020.

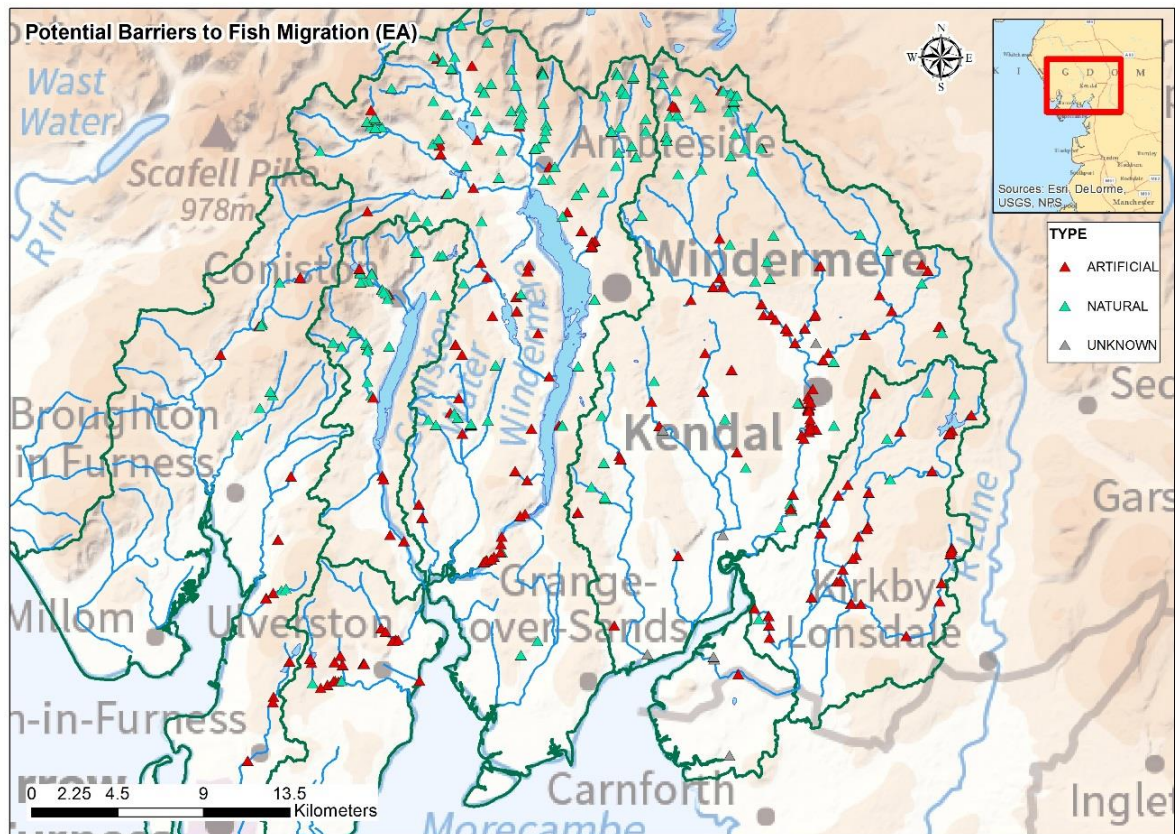


Figure 6. Potential barriers to fish migration across South Cumbria

4.2 Duddon

During 2020 no surveys were undertaken in the Duddon Valley. This catchment will be prioritized for next year (2021). Furthermore, during summer 2020, SCRT started a project, funded by United Utilities which includes the Duddon Valley above Ulpha, therefore, surveys in 2021 will help support and inform this project.

4.3 Coniston & Crake

Since October 2017 SCRT have been running the Conserving Coniston and Crake project throughout the Coniston catchment. Therefore, several of the sites surveyed this year are project sites where work has been undertaken or is planned. These surveys provided important evidence for evaluation and the development of potential projects.

Promisingly salmon fry were recorded at all sites surveyed within the Coniston catchment. Salmon parr, although not recorded at every site were also present within the catchment. The highest classification for salmon fry was 'fair' which was recorded at Langholme beck; this was the highest classification across South Cumbria during the 2020 surveys. For salmon parr the highest classification was 'poor'. It should also be noted that a shorter reach, than the standard 50m, was surveyed at Langholme beck (this has been adjusted for in the density calculations), due to the high flow conditions on the day which may surveying harder, however, SCRT staff thought that most fish were still caught and that this was representative.

Greenholme Beck was the site of a river restoration project in 2019/2020, which connected the beck to its paleochannel to bypassing a barrier to migration. During this first year of surveys following the reconnection it is promising to record salmon (a migratory species) upstream of the barrier. In previous surveys by SCRT, salmon had been recorded upstream on occasion which the highest classification being 'very poor', however, downstream levels were recorded as 'fair'. Comparatively, in 2020 the upstream classification was 'poor'. Although still not a high classification it is hoped this may improve as the beck re-naturalizes and more habitat is created. Repeat surveys of this site will be scheduled for 2021 and 2022. Trout fry were recorded as 'excellent' at both sites on the beck and parr as 'fair' above the restoration site and 'poor' at the restoration site. Again, it is hoped that over time, as the beck adjusts, and the trees grow the habitat available in the new section will improve and support healthier fish populations.



Figure 7. Section of new beck at Greenholme

Yewdale beck suffers from heavy metal pollution from the mines located in the upper catchment. Copper has been recorded at levels which are toxic to fish and other aquatic organisms. The results gained from these surveys further support this assessment, with salmon fry and parr being classified as 'poor', and trout fry and parr as 'very poor'. During 2020/21 SCRT have secured some funding to do a feasibility study to identify which areas of

the mines are potentially having the greatest influence and scope options to reduce the impact of the mines on the water course; further funding will be sought for delivery.

4.4 Windermere & Leven

Only one site, Farra Grain Gill, was surveyed in the Windermere and Leven catchment during 2020. This site was part of SCRT low risk barriers removal project, with the redundant weir at Farra Grain due to be removed later in the year. Therefore, fish data prior to removal was important to be able to quantify and understand some of the benefits to the removal of this barrier to migration. Results from the 2020 survey showed that no salmon were recorded above the weir, and only 'poor' and 'fair' population of trout fry and parr, respectively. This site will be included in the 2021 programme for a repeat visit. The EA last surveyed a site just downstream at Bowkerstead in 1994. During this survey salmon were absent, likely due to the waterfalls downstream, and trout fry were 'poor' and parr were 'fair', therefore populations appear to be a close reflection on those of 15 years ago.



Figure 8. Weir on Farra Grain Gill prior to removal in September 2020.

4.5 Kent & Winster

No surveys were undertaken in the Kent catchment; this will be prioritised for 2021. However, 2 surveys were undertaken on the Winster, at sites where restoration works in the form of fencing and buffer strip creation had been undertaken in the 2 years prior to surveys. Both sites had been surveyed previously. No salmon were recorded at either of the sites, however, Wood Farm had 'good' and 'fair' populations of trout fry and parr respectively, an improvement since 2019 when it was classified as 'poor' and 'absent'. It should be noted that the survey site was slightly further downstream and so the available habitat may be different. Further surveys will help to show any trends at this site. Additionally, in early 2020, several trees were planted in the riparian zone was planted, it will take some years before these become established, however, they will then provide further habitat and shade. Similarly, improvements were seen at Spannel beck, where a repeat survey was undertaken. In 2019

results showed that trout fry and parr were 'very poor' and 'poor', respectively; in 2020 this had changed to 'absent' and 'good', suggesting the beck is supporting populations of fish but more could be done to support spawning fish. During 2019 this site had been fenced and a hedge planted along the buffer strip, similar to wood farm, it will take time for this hedge to become established and offer full benefits to the beck. It should also be noted that there are waterfalls downstream of this site and so it is unlikely that salmon would ever be recorded here. Repeat surveys should be undertaken at both sites as part of the rolling electrofishing programme to understand how the sites are adjusting over time, and fully quantify the benefits of the projects delivered here.

4.6 Bela

Four sites were surveyed within the Bela catchment. Salmon were not recorded at any sites on the Bela, despite efforts being made over several years to improve habitat and accessibility. The picture for trout was more variable, they were still largely absent from surveys in the lower reaches of the catchment. However, a site on St Sundays beck in the upper catchment was classified as 'excellent' for trout fry and 'fair' for parr; this site was wooded and had a variety of habitats with riffles and deep pools present. Further upstream a section of river which has been historically straightened and is proposed for a restoration was also surveyed, this recorded populations of trout fry as 'fair' and parr as 'very poor', indicating that any restoration efforts here could have some benefit for the fish populations.



Figure 9. Straightened section of St Sundays beck, on the Bela, which is proposed for future restoration.

4.7 Minor Catchments

Several surveys were undertaken on Minor catchments, i.e. those outside of the five main catchments in South Cumbria. A number of these sites had never been surveyed by SCRT before, and therefore, the data is really valuable. In summer 2020 SCRT started a project in the upper parts of the Poaka and Pennington catchments, around the reservoirs. The Trust was also scoping further options for a number of projects in the Furness peninsula for the coming years, therefore, data was important to help understand the current status of the catchments. Salmon were absent from all surveys, however, there are a number of barriers

to migration in this these catchments, these will be investigated as part of up-coming projects. Trout populations were also relatively low, with the highest recorded as 'fair' for fry on Poaka beck and Pennington beck being the only site to record 'good' for parr in the area. Leighton Beck is another project area; during 2020 this catchment has been the focus of a series of water quality investigations by SCRT. Results from this suggest that there a frequently spikes in poor water quality, including a drop in dissolved oxygen. However, local knowledge suggests that fish populations are affected by the sluice at the bottom of the catchment. No salmon or trout were recorded during these surveys, further investigations are required to ensure this catchment can support healthy fish populations in the future.

4.8 Environment Agency Classifications

SCRT work closely with the EA to share data and evidence, this partnership working helps to provide a more holistic picture of fish populations across South Cumbria. However, during 2020, covid-19 lockdowns restricted the Environment Agency from undertaking any fish surveys, therefore there is no data available for comparison this year. The Crake was scheduled for survey by the EA during 2020, it is unknown if this will be done in 2021. This furthers add to the value of the surveys undertaken by SCRT.

4.9 Sources of Error

Although every effort is made to reduce sources in error it is inevitable that some occur. Firstly, as a small organisation, SCRT are not able to use the same team of people for each electrofishing survey and are reliant on the support of volunteers. There is naturally variation between different people both in terms of experience and technique. Furthermore, there can also be changes over time as surveyors become more used to the technique and potentially better at catching fish/ operating the equipment.

The same backpack and the same set up method is used at every site to help reduce variation in results. However, the conductivity of the water varies naturally, and although the backpack can be adjusted to take this into account, there are several sites across South Cumbria where the conductivity of the water is relatively low, thereby reducing the catch efficiency. Most sites surveyed in 2020 had a relatively good conductivity. Similarly, habitat and flow variation can also impact catch efficiency. Typically overhanging branches and tree roots are good habitat for fish but can also hinder the netting, potentially skewing the data. To minimize this SCRT use a number of different nets appropriate to the stream type, for example a banner net is more practical in faster flowing, deeper sections whereas a small hand net is more appropriate in a small stream with variable bed substrate. During 2020 water levels were frequently high and some surveys weren't conducted under optimal conditions, however, it was believed that gathering some data was better than none, this has been taken into account in the catchment discussions above.



5. Historic Data

South Cumbria Rivers Trust have been undertaking a full electrofishing programme over the 5 main catchments covered by the trust since 2016. Prior to 2016 a number of surveys were done but these were limited in capacity and extent. This data will shortly be available to view on the SCRT website, allowing for historic comparisons and trends over time to be viewed.

6. The National Picture

Annual reports on the status of salmon stocks and fisheries in England and Wales have been produced by the Centre for Environment, Fisheries and Aquacultures Science (Cefas) and the EA since 1997. The latest report is from 2019. Generally, the national picture reflects what has been observed in South Cumbria. The report states that more than half of the returning stock estimates and counts were below the values recorded in 2018. In many rivers with fish counters and/ or traps there has been a marked decline in the numbers of returning salmon over the last decade, however, some are now starting to increase, especially on the south coast (CEFAS, 2020). It is believed that new regulatory provisions introduced in England in December 2018 have substantially reduced the exploitation of salmon in 2019. Conversely, the poor recruitment of juvenile salmon recorded in 2016 is still likely to have potential impacts on the numbers of returning adults in 2019 and 2020.

The Kent, Leven, Crake and Duddon are all classed as salmon rivers; there is a total of 42 in England, largely on the west coast, with a further 22 in Wales. Overall, about half (51%) of all sites surveyed were in the lowest two classes of the National Fisheries Classification (very poor or absent) between 2014 and 2019, see figure Figure 10. However, according to cefas most catchments in South Cumbria support populations in the higher classes with roughly 25-50% of sites recording populations as fair or higher. In the Kent this figure is even higher at 50-75%. Nationally, there has been a small improvement in the percentage of sites classified as excellent to fair over the last three years; in 2019 this was 35% of all sites. Counts from fish counters showed that returning stock estimates for 2019 were below the levels recorded in 2018 for the majority of rivers, including those in South Cumbria. Furthermore, the survival of salmon during the marine phase of their life cycle has declined in recent decades, which may be contributing to this more local picture. However, there are still local issues such as barriers to migration and a lack of habitat which need to be addressed to support healthy fish populations.



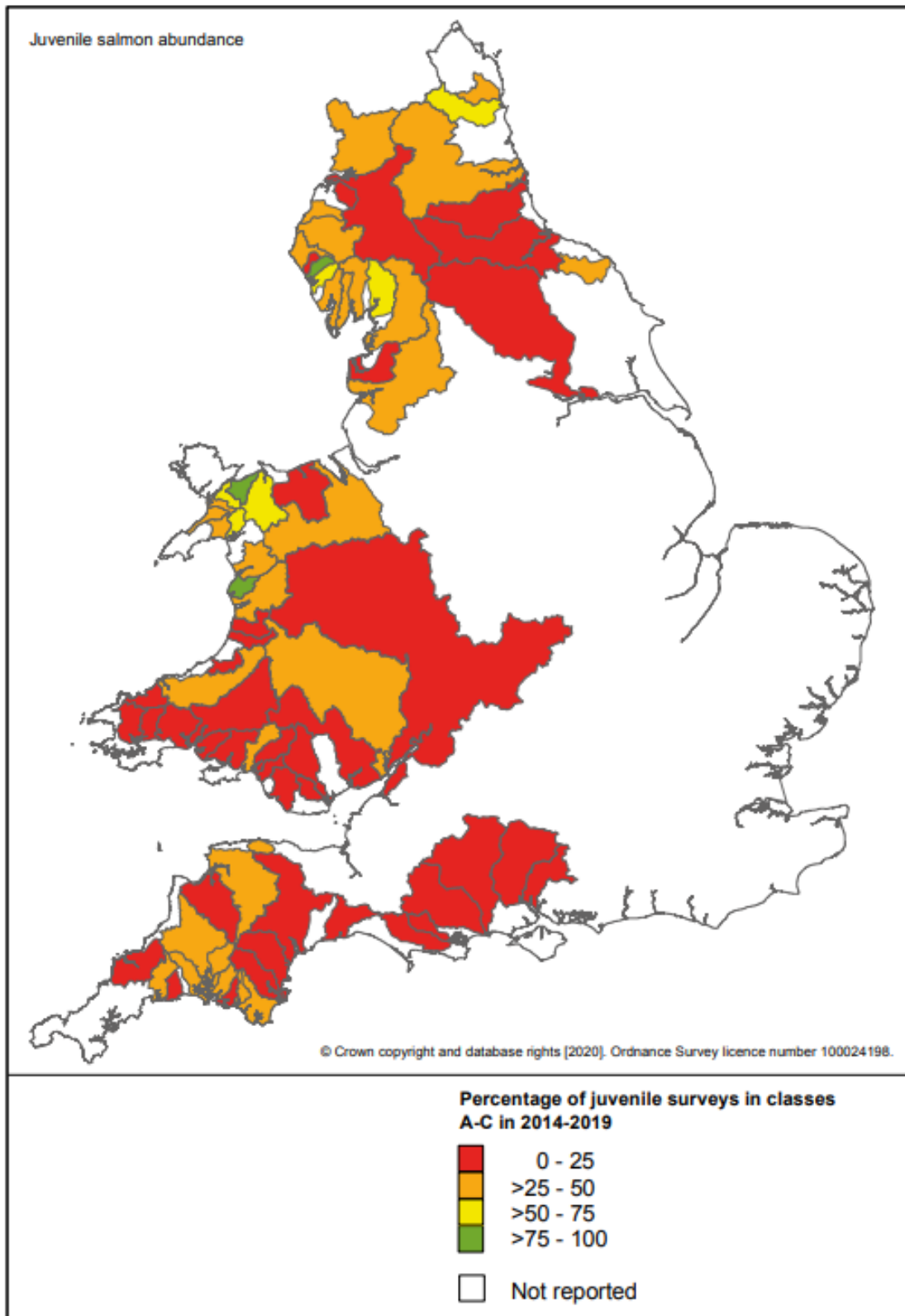


Figure 10. Juvenile salmon abundance indices for each catchment, presented as a percentage of surveys in classes A to C only (2014 - 2019). Credit: CEFAS, 2019.

7. Other Species

Native fish including bullhead (*Cottus gobio*), European eels (*Anguilla Anguilla*), brook lamprey (*Lampetra planeri*), minnow (*Phoxinus phoxinus*) and stickleback (*Gasterosteidae*) were recorded during the surveys. However, because the electrofishing surveys are targeted at salmonids and the backpack is set to be most effective for these, the results for other fish species may not be a true representation. For example, the frequency the backpack is set to is on the outer edges of the range, which is effective for European eels, meaning catch efficiency is lower. Additionally, the Environment Agency do not hold data on density for 'other fish' species so it is only the salmonid data which can be converted to take into account those missed during a semi-quantitative survey, however, the 'raw' density of fish per 100m² can be recorded. Figure 11, shows the abundance of all fish species caught at each site when adjusted for the total density of fish per 100m². Figure 12 shows the same data excluding the high value on Peasey beck for easier interpretation of species composition across other sites. The raw data is also provided in Appendix III. Peasey beck recorded the highest density of fish of any site, comprised of a large number of bullhead. Newlands Beck at Broughton also had a relatively high density of fish species, generally comprised of trout and bullhead, despite a lack of fencing and several weirs downstream which impact on migratory fish. Therefore, there is still the potential for habitat improvements. Comparatively, Gill Banks upper and Leighton beck both recorded very low densities of any fish species. At both sites it was believed to be fish access and water quality which were affecting fish populations. Further investigations are being undertaken at both locations.

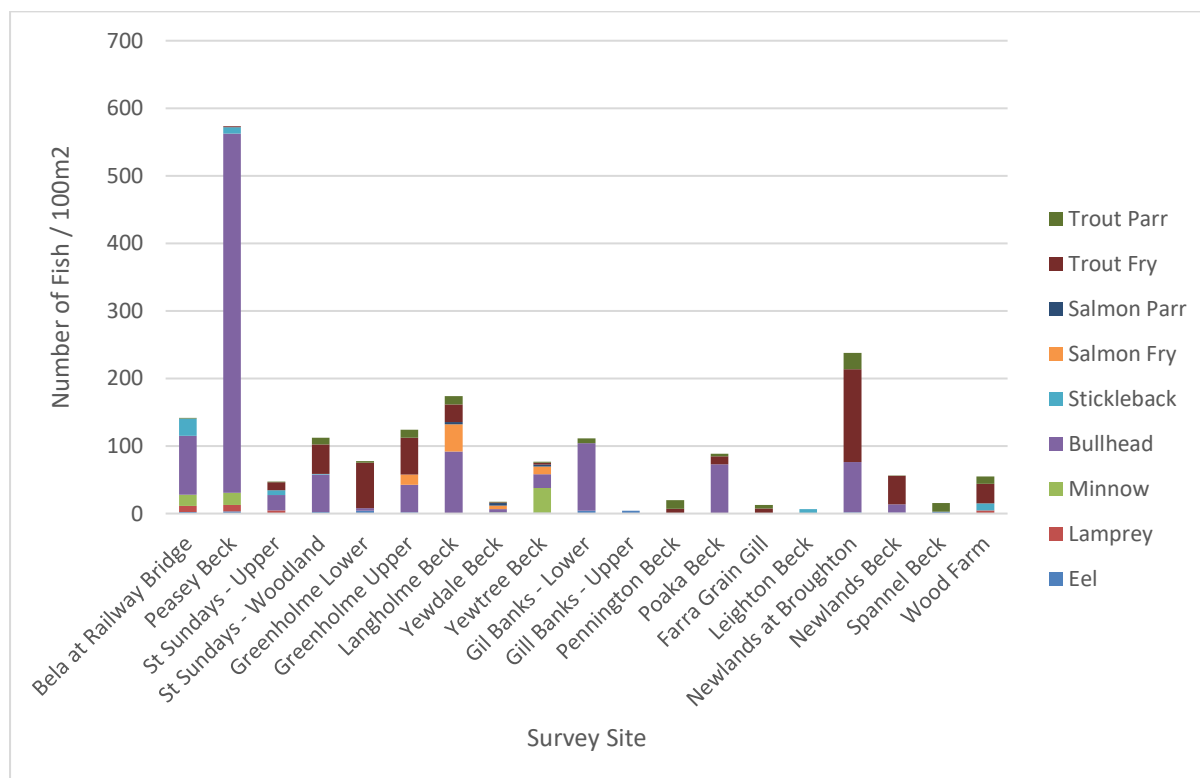


Figure 11. Abundance of all fish species recorded during 2020 electrofishing surveys. Note this has been adjusted for density however it has not been adjusted to take into account that these were semi-qualitative surveys.

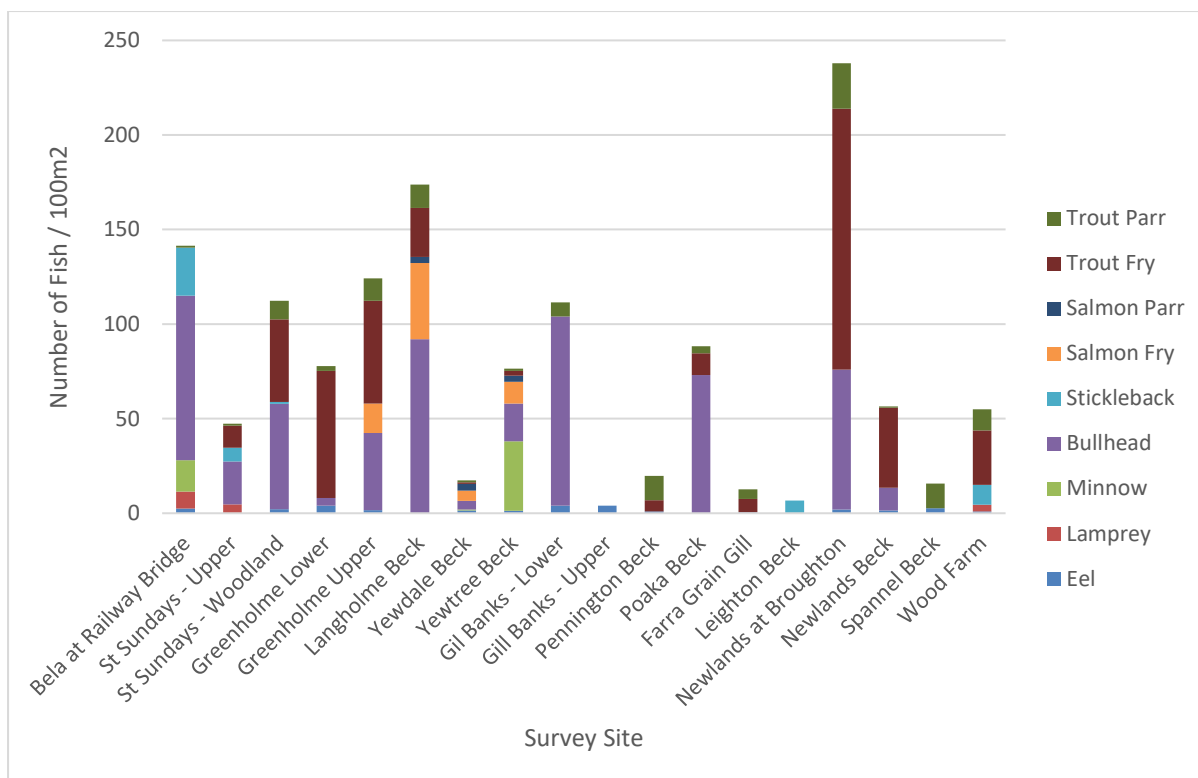


Figure 12. Abundance of all fish species recorded during 2020 electrofishing surveys (excluding Peasey Beck). Note this has been adjusted for density however it has not been adjusted to take into account that these were semi-qualitative surveys.

6.1 European eel

The European eel is critically endangered on the IUCN Red List of threatened species following a significant decline (90-95% in the last 45 years) in populations over recent years (Jacob & Gollock, 2014). However, observations made during the 2020 surveys suggest that 2020 has been a relatively good year in South Cumbria for eels. European eels were recorded at all but two of the sites surveyed (17 out of 19 sites); no eels were observed at Leighton Beck or Poaka Beck. Poaka Beck is site which SCRT are looking into further with the aim to improve eel passage and habitat through the catchment; there are currently obstructions at the lower end where the beck flows into the sea at Cavendish dock in Barrow. Similarly, it is believed there are issues with the sluice on Leighton Beck which is influencing the passage of fish; it should be noted that no fish except for stickleback were recorded on Leighton Beck. As above, it is difficult to make further conclusions about eel populations as the survey aren't adjusted for eels, and eels are typically hard to catch, often residing in tree roots or under rocks.

6.2 Bullhead

Bullhead are widespread through the England and Wales but are less common in Scotland and across Europe. They are found in fast flowing streams and rivers with hard stony substrates. Additionally, as a bottom dwelling fish, bullhead tend to hide under stones and cobbles and therefore have a reduced catch efficiency. Bullhead were frequently recorded at sites across South Cumbria. Of particular note are the high numbers recorded on the Bela, in

particular Peasey Beck; numbers here were so high that an estimation of 6x those caught was included giving an estimated total of over 500 per 100m².

6.3 Lamprey

2020 was a particularly good year for Lamprey in the surveys in South Cumbria. Brook and river lamprey are widespread but have declined in recent years; they require clean gravel for spawning and soft marginal silt or sand for the ammocoete larvae (JNCC, 2020). Prior to 2020 lamprey had only been recorded at two sites in surveys undertaken between 2015 and 2019, comparatively during 2020 lamprey were recorded at 4 different sites. Again, of note is the presence of lamprey at sites surveyed on the Bela, with 3 of the 4 sites where lamprey were recorded being within this catchment. The other site to record lamprey was Wood Farm on the River Winster.

8. Next Steps for 2021

During 2021 the Kent and Duddon will be priority catchments, as no surveys were undertaken in both catchments in 2020. A project started on the Duddon catchment in summer 2020, will be of particular interest and the electrofishing programme will aim to build data around areas of interest for this project. The project, United Utilities Raw Water, focusses on improving water quality above drinking water areas using a catchment wide approach.

Other survey sites will aim to repeat those undertaken 3 years ago on the programme, supporting the establishment of a three-year rolling programme to provide 'baseline' trend data across the catchments of South Cumbria.

As with other years, repeat surveys will also be undertaken at project sites, including Greenholme Beck in the Coniston Catchment and Farra Grain Gill, following the weir removal.

9. Acknowledgements

SCRT would like to acknowledge and thank Defra for the support of the CaBA funding which enables this monitoring to take place. Thanks also needs to go to all the volunteers who helped out on these surveys, without volunteers gathering this wealth of information would not be possible. Similarly, thanks to Enviro-tech and the Conserving Coniston and Crake teams for their support and the Environment Agency for their on-going support and co-ordination through these surveys. Finally, thanks must also go to the landowners who kindly granted us permission to access the becks and rivers on their land.



10. References

Cefas, Environment Agency and Natural Resources Wales, 2020. Salmon Stocks and Fisheries in England and Wales, 2019. Preliminary assessment prepared for ICES.

Crozier W. W. and Kennedy G. J. A., 1994. Application of semi-quantitative electrofishing to juvenile salmonid stock surveys. *Journal of Fish Biology* **45**, 159-164.

Dugdale, L.J., Brown, J., Lane, S.N. & Maltby A., 2006. Rapid Assessment of River environments, http://www.rivertrust.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.

Jacoby, D. & Gollock, M. 2014. *Anguilla anguilla*. The IUCN Red List of Threatened Species 2014: e.T60344A45833138. <http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T60344A45833138.en>

Joint Nature Conservation Committee, 2020. 1096 Brook Lamprey, *Lampretra planeri*. Access 14/12/2020: <https://sac.jncc.gov.uk/species/S1096/>



Appendix I

Raw data and national fisheries classification classes by site for electrofishing surveys in 2020.

No.	Site Name	Catchment	Grid Reference	No. Salmon Fry	Salmon Fry NCFS Classification	No. Salmon Parr	Salmon Parr NCFS Classification	No. Trout Fry	Trout Fry NCFS Classification	No. Trout Parr	Trout Parr NCFS Classification
1	Bela at Railway Bridge	Bela	SD51669 81051	0	F	0	F	0	F	1	E
2	Peasey Beck	Bela	SD51825 81264	0	F	0	F	1	E	0	F
3	St Sundays - Upper	Bela	SD55042 89637	0	F	0	F	9	C	3	E
4	St Sundays - Woodland	Bela	SD54187 88452	0	F	0	F	21	A	5	C
5	Greenholme Lower	Crake	SD28687 89082	0	F	0	F	26	A	1	D
6	Greenholme Upper	Crake	SD28570 89124	9	D	0	F	35	A	8	C
7	Langholme Beck	Crake	SD29081 86467	14	C	1	D	10	B	5	B
8	Yewdale Beck	Crake	SD31834 99765	5	E	3	D	1	E	1	E
9	Yewtree Beck	Crake	SD31590 99820	8	D	2	D	2	E	1	E
10	Gil Banks - Lower	Furness	SD28238 79226	0	F	0	F	0	F	1	D
11	Gill Banks - Upper	Furness	SD28238 79226	0	F	0	F	0	F	0	F
12	Pennington Beck	Furness	SD25777 77869	0	F	0	F	3	D	7	B
13	Poaka Beck	Furness	SD22177 73402	0	F	0	F	6	C	2	D
14	Farra Grain Gill	Minor Catchments	SD33367 92444	0	F	0	F	8	D	6	C
15	Leighton Beck	Minor Catchments	SD48453 77906	0	F	0	F	0	F	0	F
16	Newlands at Broughton	Minor Catchments	SD28514 82264	0	F	0	F	71	A	13	A
17	Newlands Beck	Minor Catchments	SD29987 79789	0	F	0	F	60	A	1	E
18	Spannel Beck	Winster & Gilpin	SD41572 86948	0	F	0	F	0	F	10	B
19	Wood Farm	Winster & Gilpin	SD41066 91273	0	F	0	F	8	B	12	C

Appendix II

Densities of all fish species caught during the fish surveys. Note these are from semi-quantitative surveys and have not been converted to quantitative.

No.	Site Name	Catchment	Grid Reference	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr	Eel	Lamprey	Minnow	Bullhead	Stickleback
1	Bela at Railway Bridge	Bela	SD51669 81051	0	0	0	0.927643785	2.5	9	16.5	87	25.5
2	Peasey Beck	Bela	SD51825 81264	0	0	1.294498382	0	3.333333	9.333333	18	532	9.333333333
3	St Sundays - Upper	Bela	SD55042 89637	0	0	11.65048544	1.078	0	4.666667	0	22.66667	7.333333333
4	St Sundays - Woodland	Bela	SD54187 88452	0	0	43.61144281	9.921323901	2.139037	0	0	55.61497	1.069518717
5	Greenholme Lower	Crake	SD28687 89082	0	0	67.31391586	2.473716759	4	0	0	4	0
6	Greenholme Upper	Crake	SD28570 89124	15.55075594	0	54.36893204	11.87384045	1.6	0	0	40.8	0
7	Langholme Beck	Crake	SD29081 86467	40.31677466	3.144654088	25.88996764	12.3685838	0	0	0	92	0
8	Yewdale Beck	Crake	SD31834 99765	5.399568035	3.537735849	0.970873786	0.927643785	1.5	0	0.5	4.5	0
9	Yewtree Beck	Crake	SD31590 99820	11.51907847	3.144654088	2.588996764	1.23685838	1.333333	0	36.66667	20	0
10	Gil Banks - Lower	Furness	SD28238 79226	0	0	0	7.421150278	4	0	0	100	0
11	Gill Banks - Upper	Furness	SD28238 79226	0	0	0	0	4	0	0	0	0
12	Pennington Beck	Furness	SD25777 77869	0	0	5.825242718	12.98701299	1	0	0	0	0
13	Poaka Beck	Furness	SD22177 73402	0	0	11.65048544	3.710575139	0	0	0	73	0
14	Farra Grain Gill	Minor Catchments	SD33367 92444	0	0	7.060900265	5.05987519	0.454545	0	0	0	0
15	Leighton Beck	Minor Catchments	SD48453 77906	0	0	0	0	0	0	0	0	6.666666667
16	Newlands at Broughton	Minor Catchments	SD28514 82264	0	0	137.8640777	24.1187384	2	0	0	74	0
17	Newlands Beck	Minor Catchments	SD29987 79789	0	0	42.36540159	0.674650025	1.454545	0	0	12	0
18	Spannel Beck	Winster & Gilpin	SD41572 86948	0	0	0	12.94498382	2.666667	0	0	0	0
19	Wood Farm	Winster & Gilpin	SD41066 91273	0	0	28.82000108	11.13172542	1	3.5	0	0	10.5



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.

Registered & Head Office: The Clock Tower Business Centre, Low Wood, Ulverston, Cumbria. LA12 8LY.

Telephone: 01539 530047 **Email:** info@scrt.co.uk

Web: www.scrt.co.uk