



River Derwent Fish and Habitat Surveys Project

Fish and Habitat Survey Report 2019





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The focus of this report is the River Derwent and its tributaries, other fish and habitat surveys are conducted by West Cumbria Rivers Trust in other areas of West Cumbria, and the data and reports for these are available upon request. Please email info@westcumbriariverstrust.org if you would like more information.

Contents

1	Executive Summary.....	4
2	Introduction.....	6
2.1	Background.....	6
2.2	Project Objectives.....	6
3	Methodology.....	8
3.1	Fish Survey Method.....	8
3.2	Licences and Consents.....	9
3.3	Site Selection.....	9
3.4	Survey Locations.....	9
3.5	Survey Timings.....	10
3.6	Fish Data Analysis Methods.....	10
4	Overall Results and Discussion.....	14
4.1	Summary.....	14
4.2	Comparison of fry numbers between 2015 and 2019.....	16
4.3	Comparison of parr numbers between 2015 and 2019.....	18
4.4	Spatial distribution and classification of 2019 salmonid fry results.....	19
5	Sub-Catchment Specific Results and Discussion.....	22
5.1	Background.....	22
5.2	River Marron Catchment.....	22
5.3	River Cocker Catchment.....	28
5.4	River Derwent downstream of Bassenthwaite Lake.....	44
5.5	River Derwent between Bassenthwaite Lake and Derwentwater.....	56
5.6	Borrowdale - Upper Derwent Catchment.....	65
5.7	River Greta Catchment.....	74
6	Conclusion.....	87
7	Acknowledgements.....	88
8	References.....	88
9	Appendix A.....	89
10	Appendix B.....	90



1 Executive Summary

- 1.1.1 The River Derwent fish and habitat survey project started in 2015 and is now in its fifth year, the project aims to complete yearly fish and habitat surveys in order to determine the health and state of the catchment of the River Derwent and its tributaries. The data collected is used to monitor the inter annual variations of the juvenile populations of Atlantic salmon (*Salmo salar*) and Brown trout (*Salmo trutta*) - collectively referred to as salmonids. It is also used to; determine underperforming areas in order to direct where habitat improvement projects are needed, monitor the effectiveness of previous habitat improvement projects, locate ecological threats such as invasive species and build up a database to ultimately determine long-term trends.
- 1.1.2 To conduct the fish surveys, West Cumbria Rivers Trust (WCRT) use the semi-quantitative electrofishing method adopted from Crozier and Kennedy (1993). This involves using an electrofishing backpack to create an electric field within the water which draws out and temporarily immobilises the fish, making them easier to catch. The survey is conducted working upstream in a zig zag pattern for 5 minutes (the constant variable between survey sites); this is the time that the electric current in the water is on. Once the survey is completed, the fish caught are identified, measured, recorded and then returned to the river unharmed. Alongside the fish data, habitat details such as type of channel substrate, presence and absence of aquatic plants and large woody debris, barriers to fish migration, bank material and vegetation, riparian land use, and presence and absence of invasive species are also recorded. Surveys are conducted between July and September and sites are selected based on a number of factors.
- 1.1.3 The salmonid fish data is then processed to determine size categories for fry and parr and then a value of catch per unit effort (time) is calculated, for this report, this value is fry per minute. Each survey site is then assigned a grade of A to F with A being the highest quality sites with the most fry, based on the quintiles (20% percentiles) of the entire data set.
- 1.1.4 Spatial and temporal trends are then determined in the context of the whole catchment, but these trends especially the temporal ones are to be viewed with the following caveats in mind:
- Fish populations are extremely variable, particularly salmonids which are migratory species and therefore the results just represent a snap shot in time and are an indication of fry abundance.
 - The weather conditions between the survey years has varied dramatically, the 2016 survey season being post Storm Desmond which brought large-scale flooding during spawning season; and the 2018 survey season starting in drought conditions, with many becks and tributaries being bone dry or reduced to a trickle.
 - The number of survey sites has increased each year.
 - The survey team differs from day to day due to the nature of using volunteer assistance to conduct the work, which may affect catch rates and efficiency, but the backpack operator is always the same, to try and minimise this.
- 1.1.5 During the 2019 survey season, WCRT conducted surveys at a total of 161 sites. In total, 5,115 salmonids were recorded, of which 2,640 were trout and 2,475 were salmon. These numbers can be broken down further into fry and parr numbers; 2,138 were trout fry and 2,155 were salmon fry (fry being less than a year old); and 502 were trout parr and 320 were salmon parr (parr being young fish over a year old). Of the total 161 sites surveyed, 125 sites (78%) had trout fry present and 78 sites (48%) had salmon fry present. Only three sites had no fish present at all, including minor species.

- 1.1.6 Comparing the data across the five years of surveys, trend lines show that overall, trout fry appear to be making modest gains since the surveys began, with a small dip in 2016 when Storm Desmond hit during spawning season, but overall are maintaining a presence in most watercourses. Salmon fry, on the other hand, were recorded in relatively low numbers for the first 3 years of the surveys, before numbers increased significantly in 2018, before decreasing slightly in 2019. The large increase in 2018, was at first attributed to the ability to survey the main river sites, which had not been surveyed before and is where the preferred habitat of salmon fry can be found; but the main river sites were repeated in 2019 and in order to compare the data fairly the main river sites were removed from the five-year trend line and analysed separately. Despite this, 2018's salmon numbers were still significantly higher than the prior 3-year period and reflects the suitable conditions of that spawning season. Out of interest, the temporal trend for parr numbers was also looked at, despite this report focussing on fry; and the trend showed a decrease in the number of trout parr, whereas salmon parr on the other hand increased.
- 1.1.7 The spatial distributions showed that the majority of trout fry were found in the tributaries and the upper reaches of the catchments, whereas the salmon fry were mainly found in the main rivers and in other well-known spawning tributaries such as Whit Beck - Lorton, the River Glenderamackin and St John's Beck. The high number of salmon fry in the main rivers once again reflects that the habitat is more suited to them here and highlights why the main River Derwent is designated a SSSI and SAC for Atlantic Salmon. Also, in 2019, a lot of salmon fry were recorded in places they have not been before/ for a while, such as Eycott Hill, Mungrisdale Common and Tongue Gill. This shows that habitat improvement works in those areas is having an impact on water quality, fish passage, spawning opportunity and providing suitable fry habitat to allow fry to be present in these areas.
- 1.1.8 The habitat data collected is vital to interpreting the fish results and generally it was noted that sites with greater fish densities reflect the sections of river with good habitat. The data also helps to identify areas that are underperforming due to factors other than poor habitat, such as poor water quality. The habitat data helps to build up the picture of what is going on at individual sites but also within the overall catchment. This habitat database is then used to inform WCRT and partners where habitat work would provide the greatest benefit for fish populations. All the data recorded is adding to the fish and habitat databases that will ultimately be used to determine long-term trends and the effects of climate change and other factors on fish populations and the wider catchment.
- 1.1.9 The River Derwent Fish and Habitat Survey Project in 2019 was funded through a variety of funding sources including; the Water Environment Grant funding scheme which is funded through the European Agricultural Fund for Rural Development (surveys within the River Cocker and Glenderamackin catchments only), The Derwent Rivers Corridor Group, The National Trust, Cumbria Wildlife Trust, the Derwent Owners Association, Cockermouth Anglers Association, Keswick Anglers Association, Bowland Game Fishing Association and Lancaster University.
- 1.1.10 The project also couldn't happen without the many dedicated volunteers who helped undertake the surveys throughout the summer and the 100+ landowners and tenants who gave permission to access the river from their land, encouraged us to do so and showed great interest in the results.

2 Introduction

2.1 Background

- 2.1.1 WCRT aims to complete yearly catchment characterisation surveys of the Derwent catchment, involving salmonid fish and habitat surveys. These types of fisheries surveys are ideal for providing information to determine spawning success, characterise the habitat and provide a general indication of the health of stretches of river. The data collected feeds into WCRT's monitoring programmes to help evaluate the success of projects such as river restoration and habitat improvement work. It also provides evidence of where further work to improve habitat, water quality and fish migration is needed and helps to elicit further funding to undertake these projects.
- 2.1.2 The main purpose of the fish surveys is to assess the status and distribution of the juvenile salmonid population, namely Atlantic salmon fry (*Salmo salar*) and Brown trout fry (*Salmo trutta*) - aged less than one year. This helps to determine the spawning success of the returning adult fish and is a key indicator in the health of the system. However, fish populations are naturally extremely variable, both within rivers and through time, due to the migratory nature of the species, and therefore individual surveys cannot provide statistically sound measures of spatial or temporal change. The results of the surveys undertaken must therefore be viewed within the context of the whole of the Derwent catchment, which this report aims to do. Also, in order to detect trends, many years' worth of data are needed.
- 2.1.3 The River Derwent and its tributaries are designated as a Site of Scientific Interest (SSSI) and a Special Area of Conservation (SAC) for its population of Atlantic salmon alongside other species including Brook, River and Sea Lamprey, Otter, Marsh Fritillary Butterfly and various flora such as floating water plantain. Other important fish species found within the Derwent catchment include Vendace in Derwentwater and Bassenthwaite Lake and Arctic Charr in Crummock Water.
- 2.1.4 The Environment Agency (EA) is the statutory body responsible for fisheries, conservation and ecology and their fisheries monitoring programme provides comprehensive coverage of the catchment at a level appropriate to current legislative responsibilities. Monitoring by the EA has however been greatly reduced due to funding cuts and WCRT aims to share all the results, experience and knowledge from this project with them and other interested parties. WCRT has also designed its programme to complement, rather than duplicate, the EA's programme and collaboration will take place to deliver many aspects of this work. WCRT is not a statutory body and does not have specific responsibilities to carry out monitoring, however, WCRT appreciates the importance of such studies to help target resources to improve the ecological health of the catchment's rivers and riparian habitats.

2.2 Project Objectives

- 2.2.1 This project's objective is to determine the health and state of the River Derwent and its tributaries, by assessing the status and distribution of the juvenile salmonid population, alongside the corresponding habitat data.
- 2.2.2 The data gathered will be used to achieve the following aims:
1. Assess the overall status of the juvenile population of salmonids;
 2. Monitor the inter-annual variations of the salmonid population;

3. Determine underperforming areas and direct where habitat improvement works are needed; which is then fed into a catchment action plan to help facilitate prioritisation of funding and projects by WCRT, partner organisations and stakeholders;
4. Evaluate the effectiveness of projects such as habitat improvement works, river restoration, fish easement;
5. Generate data and evidence in support of grant bids and funding applications;
6. Locate ecological threats posed by invasive species, pollution incidents, etc; and
7. Build up a database of fish and habitat data to ultimately determine long-term trends.



3 Methodology

3.1 Fish Survey Method

3.1.1 Electrofishing is a common method used to survey fish populations. It involves creating an electric field in the water to draw the fish out, temporarily immobilising them and therefore making them easier to catch with a hand net. Prior to surveying, conductivity and temperature readings are taken to help the user determine the settings for the electrofishing equipment.

3.1.2 WCRT have two different types of electrofishing kit available to use when surveying, two E Fish 500W electrofishing backpacks and a Hans-Grassl IG600L. The latter is more suitable for low conductivity areas such as the upper reaches of the catchment as these sites are at the upper limits of the E fish kits capabilities.

3.1.3 There are two main methods of surveying; full quantitative surveys which are area based, to calculate the number of fish per 100m², which is the nationally used unit and allows comparison with the data collected by other researchers. To do a fully quantitative survey, a 100m² stretch of river is netted off at both ends and the whole area is fished multiple times (usually three) until no fish remain and the total number of fish per 100m² is discovered. Quantitative surveys can be quite time consuming and require a lot of resources and therefore WCRT adopt the semi-quantitative survey method as set out in Crozier and Kennedy (1993). The semi-quantitative survey method requires fishing for a set length of time, usually a standard 5 minutes. The 5-minute time period is programmed into the kit which only times when the electric pulse is being used. The river is then fished in a zig zag pattern, working upstream against the flow, (see Figure 1), until the time runs out. The distance fished during the 5 minutes is measured along with the width of the survey site.

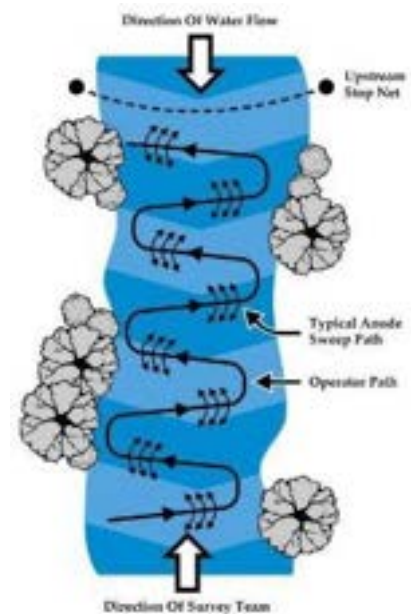


Figure 1: A diagram to show the survey method of the quantitative method but is also similar to semi quantitative in terms of the zig zag pattern and the direction of travel. (Diagram from E Fish 500W kit manual, 2012).

3.1.4 Most survey sites are located on tributaries and the aim within the 5-minute survey is to cover both pool and riffle habitat, by starting with a riffle and ending in a pool. Where main river sites are surveyed, this is during low flows and tend to only be in shallow riffles or off the edges of gravel bars.

3.1.5 All fish species caught are identified and recorded, however only the salmonids are measured. In order to measure the salmonids, they are placed on a board which has an inbuilt ruler, mouths at zero and the value is taken from where the fork in their tail falls and rounded to the nearest 5mm. This data is then used to calculate an index of fry abundance, which can be a catch per unit of effort (time) or a fish density per unit area. (Scottish Fisheries Co-ordination Centre (SFCC), 2007).

3.1.6 Once recorded and measured, all fish are then returned to the river, unharmed.

3.1.7 Habitat survey data is also collected at each site alongside the fish data. This includes:

- Length and width of area surveyed within the 5 minutes, along with average depth (ankle, calf or knee);
- Conductivity, temperature and water clarity (optimal or sub optimal);

- Weather conditions, any previous floods or droughts, water levels (high, medium or low);
- Type of channel substrate (boulders, cobbles, gravel, silt etc.);
- Presence and absence of plant life, (submerged, emergent or algae);
- Presence and absence of large wooded debris (LWD);
- Barriers to fish migration such as weirs, culverts, waterfalls;
- Bank material, reinforcements or modifications, including erosion or damage, and any signs of dredging;
- Riparian fencing, stock access, stock type, adjacent land use;
- Bankside vegetation, woody debris/tree roots and shading;
- Presence of invasive species such as Himalayan balsam, Japanese knotweed, American signal crayfish; and
- Other details such as potential pollution sources, human activity in the river and signs of terrestrial species, or invertebrates.

3.2 Licences and Consents

- 3.2.1 Prior to surveying, a licence to fish using electric survey methods is applied for from the Fisheries Movement Team at the Environment Agency.
- 3.2.2 Landowner consent to access the survey sites is also sought.

3.3 Site Selection

- 3.3.1 Sites are selected to ensure an even coverage across the catchment, mainly on primary and secondary rivers, however, due to limitations in the equipment and survey methods, sites tend to be on tributaries rather than the main rivers.
- 3.3.2 Site selection is also based on where works have happened or are proposed, to fulfil monitoring requirements, reporting requirements and in support of funding bids. Sites can also be selected to determine whether fish can get over obstacles, to monitor known sources of pollution or help determine sources of pollution.
- 3.3.3 Sites are also selected to complement the ones done by the Environment Agency rather than duplicate. The Environment Agency have a rotational sampling programme across the whole of Cumbria and Lancashire, this programme usually uses the quantitative survey method. In 2019, the EA only surveyed 6 sites within the Derwent catchment as part of this sampling programme. However, they also conducted 21 semi-quantitative/ timed surveys within the Cocker catchment as part of a separate fry relocation programme.

3.4 Survey Locations

- 3.4.1 2019 marks the fifth consecutive year of surveying, with a total of 263 sites having been surveyed during this time. A total of 19 sites have been surveyed for five consecutive years, 44 have been surveyed for four times within the five years, 66 have been surveyed three times within the five years and 62 have been surveyed twice within the five years. 72 have been surveyed just the once.
- 3.4.2 It is proposed that going forward, roughly 100 sites are selected as priority, that are surveyed every year. The other sites will go onto a two yearly cycle to allow even coverage within the



survey window, but also allowing monitoring aims to still be met. At the moment roughly 150 sites get surveyed in one survey season depending on the weather and river levels.

3.4.3 A total of 161 sites were surveyed in the 2019 season.

3.5 Survey Timings

- 3.5.1 Surveys are undertaken between July and September. July is the optimal time to begin, when the fry are big enough to identify and robust enough to survey without injury. The season ends at the end of September to prevent disturbance to returning adult salmon.
- 3.5.2 Attempts are made to try and survey sites in a similar order to previous years to ensure that the data is collected at roughly the same time each year and that the data is comparable between the years. To do this data is usually collected at the bottom of the catchment first and working in a systematic order to the top of the catchment by the end of the season.
- 3.5.3 Surveying is weather dependant and therefore efforts are taken to try and avoid fishing in the rain as this can lead to reduced visibility and higher flows, thus reducing catch efficiency.
- 3.5.4 The weather during the 2019 survey season was dry in July with medium to low flows leading to ideal survey conditions. August was very wet with very high flows, preventing surveying occurring on many days, September was better though still wet on occasions with medium to high flows.

3.6 Fish Data Analysis Methods

- 3.6.1 The data collected is recorded on survey sheets in the field, which is then transferred to a spreadsheet. An example of the survey sheet can be found in Appendix A on page 89.
- 3.6.2 Before any analysis can be undertaken the salmonid fish data needs to be split to determine fry and parr. To do so, the frequency of each fish length is plotted on histograms. Individual sites can be grouped together based on how close they are in location and when they were fished. For example, Figure 2, shows a histogram which represents salmon at all the sites surveyed in the Marron sub-catchment in 2018, the x-axis shows the length of fish in mm and the y-axis shows the frequency of each size. The cut off value between fry and parr is where the natural breaks are in the distributions, or if no obvious break the intersecting point of the bell curves can be used. In Figure 2, the natural break is 90mm between fry and parr for salmon in the Marron sub-catchment in 2018.

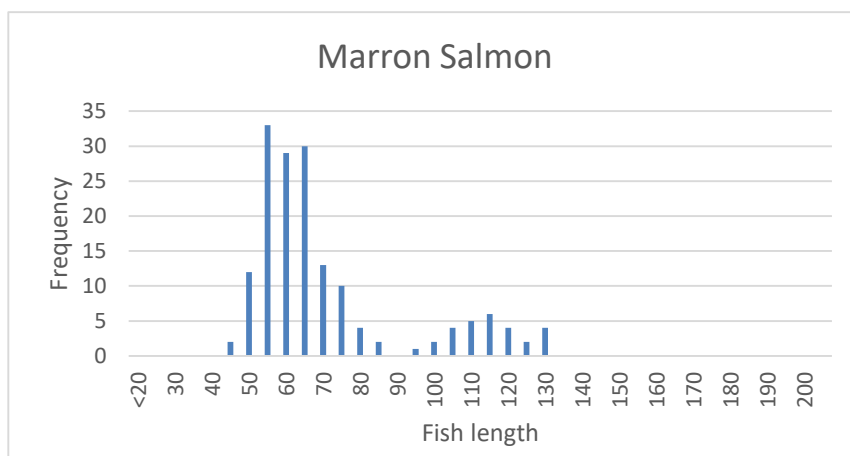


Figure 2: An example histogram used to determine the cut off value between fry and parr for salmon in the Marron sub-catchment in 2018.

- 3.6.3 Once fry and parr values have been determined, this data is then used to calculate an index of fry abundance, which can be a catch per unit of effort (time) or a fish density per unit area. (Scottish Fisheries Co-ordination Centre (SFCC), 2007).
- 3.6.4 Then this index of fry abundance is statistically assigned a grade of excellent to poor based on the value. In the past, we have used the EA's National Fisheries Classification Scheme (NFCS). The NFCS scheme grades from A (the top 20% of fisheries performance in England and Wales) to E (the bottom 20% of fisheries performance in England and Wales), with F as no fish present. However, in order to use the NFCS scheme, the fish population data needs to be translated into fish densities per 100m². To do this data needs to be calibrated. The most common form of calibration is to calibrate results from semi-quantitative methods against quantitative methods. In 2016, a calibration exercise was undertaken between the Environment Agency's quantitative surveys and WCRT's semi-quantitative surveys. During calibration WCRT would conduct the first run, using the middle section between the nets and counting the number of fish caught after five minutes (the semi-quantitative method). The EA would then do the second, third and fourth runs until no fish were left or had a depletion rate (the quantitative method). The results from the semi-quantitative survey are then plotted on a scatter graph against the results from the full quantitative survey to get a regression correlation. The equation or trend line that represents the correlation is then used to extrapolate the number of fry caught in a five-minute survey to get a calibrated result per 100m². The correlation equation produced in 2016 can be seen below in Table 1.

Table 1: Calibration trend lines with coefficients of determination which can be used to convert numbers of fish per 5-minute survey to number of fish per 100m².

	Calibration trend line	Coefficient of determination (r ²)
Trout	Y = 3.8712 x - 1.7945	0.6137
Salmon	Y = 3.0923 x - 05313	0.6326

- 3.6.5 Best practise would state that ideally calibrations between semi-quantitative methods and quantitative methods should occur every year as the calibration equation represents the conditions the survey was conducted in and the survey team that was used and obviously these can change from year to year. However, several papers (SFCC, 2007; Wyatt and Lacey, 1994), say that historical quantitative data can be used in producing calibration equations as long as the data is from the same site, or from similar or adjacent sites. However, the value of using historical data will depend on the relative importance of site characteristics (gradient, morphology, substrate) and survey characteristics (light, temperature, flow, water clarity and differing operators and catchers). If one of these factors differed between the two sets of data and potentially affected the number of fish caught, then the corresponding equation produced may not be a true representation and therefore calibration.
- 3.6.6 There are also other means of calibrating as discussed in Farooqi and Aprahamian, (1993) and Wyatt and Lacey (1999) but the method described above is the most commonly used and the approach WCRT had adopted in 2016. Unfortunately, there has not been an opportunity to calibrate in 2017, 2018 or 2019 due to lack of Environment Agency resources.



- 3.6.7 Even though WCRT have adopted the approach of assigning a NFCS classification to our data in previous reports, because we have not calibrated for the last few years and because the methods used for collection and analysis varied slightly in the first few years as we got used to conducting an electrofishing programme and what was required to do this. In order to make an attempt at comparing the data across the five years, in this report, we have adopted the same approach as The Spey Foundation in their 2018 electrofishing report. They show their results as a catch per unit of effort (time) rather than fish density per unit area. This eliminates some of the bias of extrapolating the data to 100m² as well as providing a suitable method to compare all the data we currently have.
- 3.6.8 Firstly, the data was turned into fish recorded per minute values. To do this, the number of fish recorded was divided by 5; 5 because the surveys are 5 minute surveys and this is the constant variable.
- 3.6.9 For example:

Site 1 had 12 salmon fry recorded within the 5-minute survey.

$$12/5 = 2.4 \text{ (salmon fry/min)}$$

- 3.6.10 Once this has been applied to all the data across the five years, all the data is then collated together and the figures ranked and split into quintiles (20% divisions), excluding sites where no fry were recorded. Each quintile was given a classification indicating the relative number of fish caught per minute. Then all the data was given a grade based on where they fell within the boundaries. The classification boundaries for the quintiles for each species can be seen in Table 2.

Table 2: The boundaries of the classifications for fish per minute values based on the quintiles of the data set.

Classification	Grade		Range/ Boundaries			
			Trout Fry	Trout Parr	Salmon Fry	Salmon Parr
Excellent	A	Q5	4.7 - 18.4	1.5 - 10.6	8.0 - 67.6	1.1 - 5.0
Good	B	Q4	2.3 - 4.6	0.9 - 1.4	2.9 - 7.9	0.7 - 1.0
Moderate	C	Q3	1.1 - 2.2	0.5 - 0.8	1.3 - 2.8	0.5 - 0.6
Fair	D	Q2	0.5 - 1.0	0.3 - 0.4	0.5 - 1.2	0.3 - 0.4
Poor	E	Q1	0.1 - 0.4	0.1 - 0.2	0.1 - 0.4	0.1 - 0.2
Absent	F	0	0	0	0	0

3.6.11 However, using this method for analysis does not eliminate all errors, and therefore, when looking at the data from year to year it should be noted that:

- Fish populations are extremely variable, particularly salmonids which are migratory species and therefore the results just represent a snap shot in time and are an indication of fry abundance.
- The weather conditions between the surveys years has varied dramatically, the 2016 survey season being post Storm Desmond which brought large-scale flooding during spawning season; and the 2018 survey season starting in drought conditions, with many becks and tributaries being bone dry or reduced to a trickle.
- The number of survey sites has increased each year.
- The survey team differs from day to day due to the nature of using volunteers to conduct the work, which may affect catch rates and efficiency, but the backpack operator is always the same, to try and minimise this.



4 Overall Results and Discussion

4.1 Summary

4.1.1 During the 2019 survey season a total of 161 sites were surveyed across the Derwent Catchment. A total of 2,640 trout were recorded of which 2,138 were trout fry and 502 trout parr. 2,475 salmon were recorded of which 2,155 were salmon fry and 320 salmon parr.

4.1.2 Of the total 161 sites surveyed, 125 sites (78%) had trout fry present and 78 sites (48%) had salmon fry present. 74 sites (46%) had adult European eels (*Anguilla anguilla*) or elvers (young eels) present, 104 sites (65%) had minor fish species present such as lamprey, sticklebacks, minnows, stone loach and bullhead.

Bullhead (*Cottus gobio*) were once again recorded on Trout Beck during the 2019 survey season and were also recorded on the Glenderamackin where they have not been recorded by WCRT before, though the EA hold records of them being here.

Figure 3 shows a photograph of a rather large Bullhead caught on Trout Beck

during the 2019 survey season. Just three sites had no fish at all. Full details of numbers and types of fish recorded at each site can be found in Appendix B on page 90.

4.1.3 Table 3 on page 15 summarises the 2019 survey sites and fish numbers and compares these to the previous four years. The number of sites surveyed has increased since 2015, but in the latter two years levelled out at about 160 sites per year.

4.1.4 The following paragraphs discuss spatial and temporal trends which are based on figures for the whole catchment, but these trends especially the temporal ones are to be viewed with the following caveats in mind:

- Fish populations are extremely variable, particularly salmonids which are migratory species and therefore the results just represent a snap shot in time and are an indication of fry abundance.
- The weather conditions between the survey years has varied dramatically, the 2016 survey season being post Storm Desmond which brought large-scale flooding during spawning season; and the 2018 survey season starting in drought conditions, with many becks and tributaries being bone dry or reduced to a trickle.
- The number of survey sites has increased each year,
- The survey team differs from day to day due to the nature of using volunteer assistance to conduct the work, which may affect catch rates and efficiency, but the backpack operator is always the same, to try and minimise this.



Figure 3: A photograph of a Bullhead (*Cottus gobio*) caught on Trout Beck during the 2019 survey season.

Table 3: A summary table of the data collected across the five years of surveys.

	2015 Trout	2015 Salmon	2016 Trout	2016 Salmon	2017 Trout	2017 Salmon	2018 Trout	2018 Salmon	2019 Trout	2019 Salmon
Number of sites surveyed	89		138		120		157		161	
Total numbers of salmonids recorded	1171	554	614	551	1875	669	2606	4243	2640	2475
Total number of fry recorded	846	482	451	461	1741	597	2022	4011	2138	2155
Total number of parr recorded	325	72	163	90	134	72	584	232	502	320
Number of sites with fry	80	36	92	61	103	48	127	83	125	78
Average number of fry per site	10	5	3	3	15	5	13	26	13	13
Number of sites with no salmonids present	4	46	29	66	10	63	23	67	23	67
Number of sites with no fish present	0		2		3		3		3	

4.2 Comparison of fry numbers between 2015 and 2019

4.2.1 The temporal trends for total salmonid fry numbers between 2015 and 2019 for the whole Derwent catchment can be seen in Figure 4. Trout seem to be making small gains, but decreased in 2016 due to Storm Desmond hitting during spawning season and washing most of the redds out. Salmon have stayed consistently low within the first 3 years of the 5-year survey period, with a large increase between 2017 and 2018, followed by a small decrease.

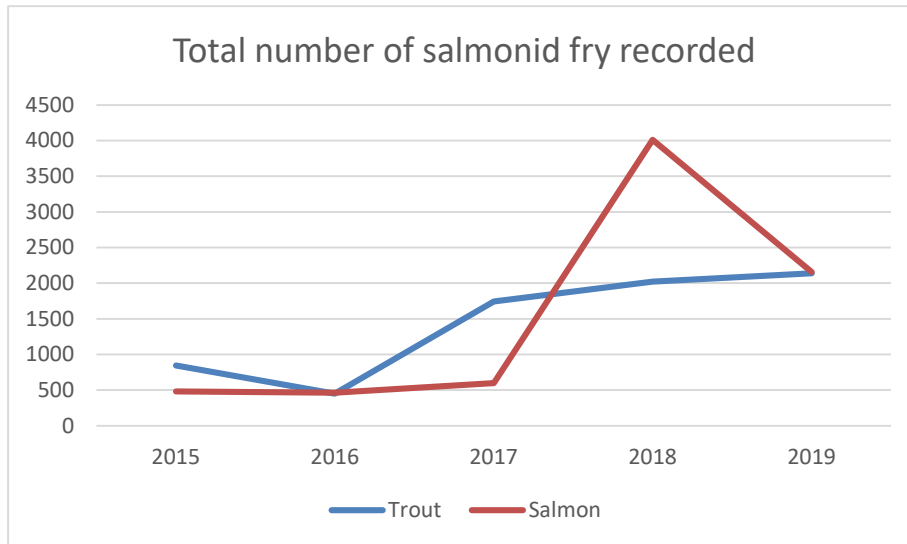


Figure 4: A line graph showing the total number of salmon and trout fry recorded over the five years of surveys within the Derwent catchment.

4.2.2 To confirm this trend is not just because the number of sites surveyed has increased over the years, the average number of fry per site was calculated for all the years and then the averages plotted on a similar graph which can be seen in Figure 5. The trend lines are very similar; however, the trout trend line shows a small decrease in 2018 rather than an increase which is most likely due to the drought affecting the number of fish recorded in the smaller tributaries.

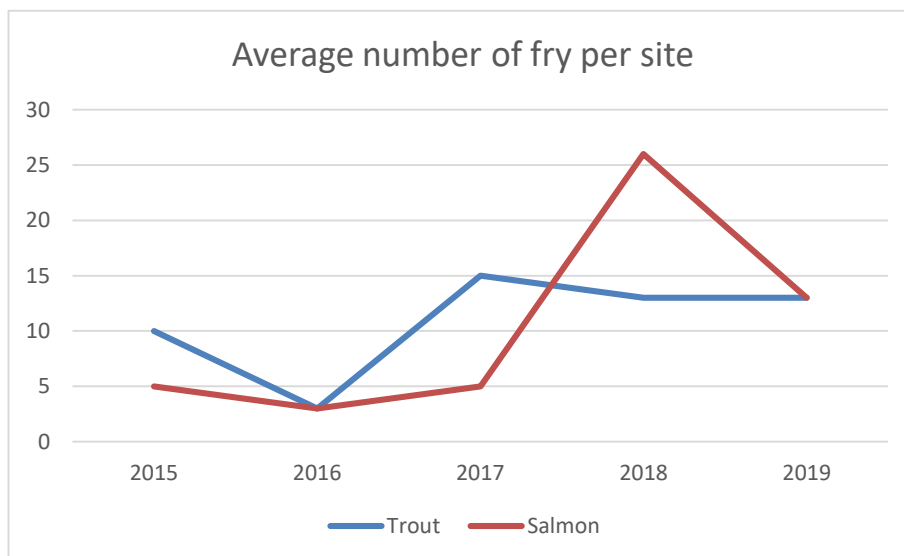


Figure 5: The average number of fry per site for both salmon and trout.

4.2.3 However, despite the averages, the salmon trend line in particular, is still highly skewed due to the main river sites. 27 main river sites were surveyed for the first time in 2018 and 26 repeated in 2019, as conditions once again were suitable at the start of the season. Main river sites had not previously been surveyed for a variety of reasons, mainly high and fast flows. In 2019 these sites elicited excellent numbers of salmon fry both in the River Derwent and River Cocker again. The main River Marron however, had concerningly low numbers compared to the previous year and no sites were surveyed on the Greta in 2019.

4.2.4 To get a more accurate trend line, the main river sites for 2018 and 2019 were removed from the graph. Figures 6 and 7 show the revised trend lines for tributaries only (no main river sites) and the main river sites respectively.

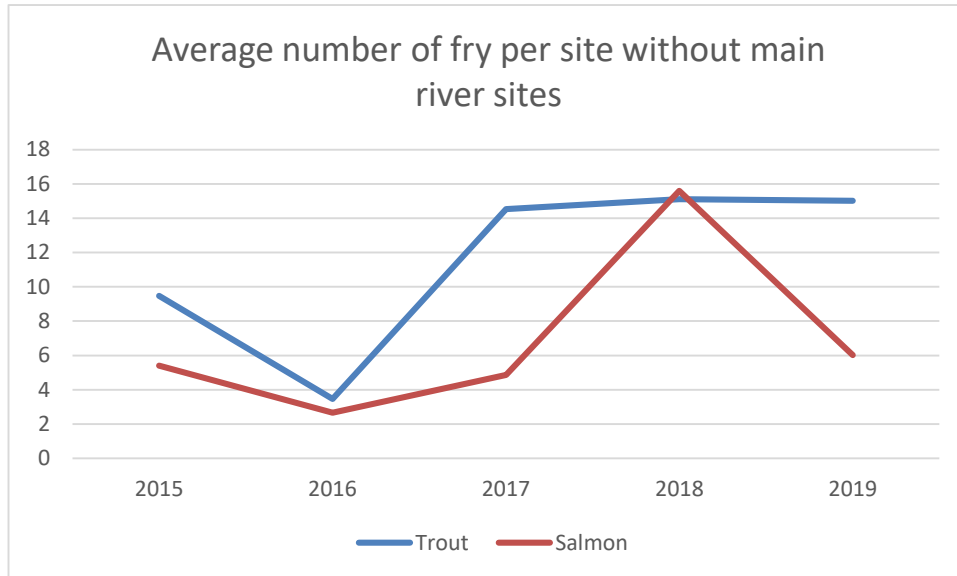


Figure 7: The temporal trends for average number of salmonid fry per site without the main river sites included.

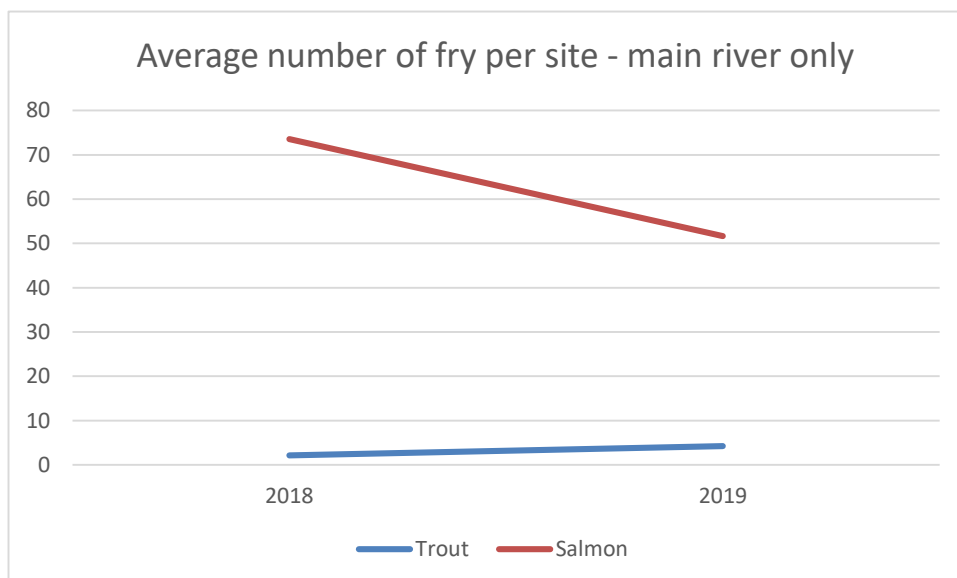


Figure 6: Average number of fry per site for just the main river sites in 2018 and 2019.

- 4.2.5 In Figure 6, the trend lines are very similar to the previous two graphs, showing that even without the inclusion of main river sites, salmon numbers were higher overall in 2018. Therefore, 2018 was just a good year for salmon fry and numbers in the tributaries were also good, despite the drought. Figure 7, shows a slight drop in the numbers of salmon surveyed in the main river sites between 2018 and 2019, with a marginal increase for trout.
- 4.2.6 Despite a drop in salmon fry compared to last year, for both the tributaries and the main river, 2019 still had the second highest numbers for salmon fry across the 5-year survey period. Again, the high number of salmon fry in the main rivers also reflects that the habitat is more suited to them here and highlights why the main river Derwent is designated a SSSI and SAC for Atlantic salmon.

4.3 Comparison of parr numbers between 2015 and 2019

4.3.1 Although the focus of this report is on fry, out of interest salmonid parr numbers have been plotted on a graph similar to those above and can be seen in Figure 8. The trend lines in Figure 8 show that trout parr dropped in 2016 most likely due to Storm Desmond, but are then followed by a further decrease in 2017 rather than an increase like the fry. This is likely a knock on effect through the generations of Storm Desmond as the small numbers of fry in 2016 become parr in 2017. Then there is a large increase in 2018 and a small decrease in 2019. On the other hand, salmon parr are maintaining a low presence throughout 2015 to 2017, with a very small dip in 2016, followed by a large increase in 2018 and another in 2019, again as the large numbers of fry recorded in 2018 become parr in 2019.

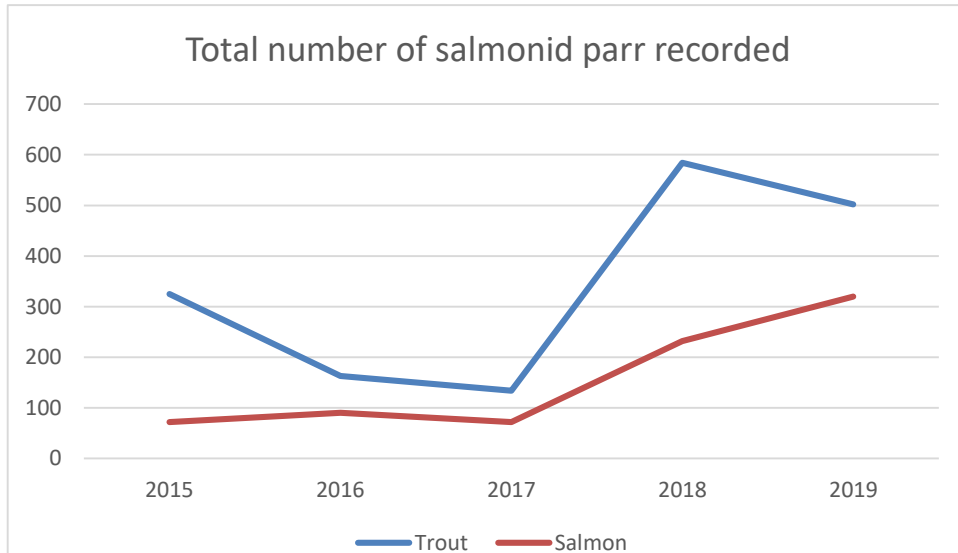


Figure 8: A line graph showing the total number of salmon and trout parr recorded over the five years of surveys.

4.4 Spatial distribution and classification of 2019 salmonid fry results

- 4.4.1 The spatial distributions of salmon and trout fry across the Derwent catchment recorded during the 2019 survey season can be seen in Figures 9 and 10, on pages 20 and 21. In the diagrams, the sites have been given a grade according to the quintiles set out in Table 2.
- 4.4.2 Figure 9 shows that trout fry are mainly found in the tributaries, such as the upper tributaries of the Marron, upper tributaries of the Glenderamackin, and Newlands Beck. Tom Rudd Beck, Bitter Beck, Wythop Beck, Dash and Chapel Beck are all particularly good for trout fry, along with the Cocker tributaries such as Whit Beck, Hope Beck, Liza Beck and Gatesgarth. There are also several tributaries such as Blumer Beck and Naddle Beck where salmon are present at the bottom of the watercourse and trout are prevalent in the upper reaches.
- 4.4.3 Figure 10 shows that most of the salmon were recorded in the main river, and then well-known spawning tributaries such as St John's Beck, Naddle Beck, Glenderaterra and Whit Beck; and that salmon fry are not found in many of the smaller tributaries. However, due to high flows in late summer and autumn, this allowed many adult fish to get further up the catchment; several sites in the upper parts of the catchment that have not recorded salmon there before such as Mungrisdale Common and Eycott Hill, had salmon fry present during the 2019 surveys. Which is great news and also coincides with work that has been undertaken at Eycott Hill to improve water quality and habitat; and work to address the barrier to fish migration in Mungrisdale village. This shows that habitat improvement works in those areas is having an impact on water quality, fish passage, spawning opportunity and providing suitable fry habitat to allow fry to be present in these areas.
- 4.4.4 As seen in Figures 9 and 10, each site is given a grade of A-F. Table 4 shows the number of sites within the River Derwent catchment for each grade, and compares 2019 to the previous four years. The number of "A" grades has increased for both trout and salmon fry, as has B-D grades for trout fry. "F" for both trout and salmon fry has increased but only marginally and probably due to the increase in the number of sites surveyed across the years. The middle grades of B-E for salmon fry varies from year to year.

Table 4: Number of sites within the River Derwent catchment grade A-F.

Classification/ Grade	Trout Fry					Salmon Fry				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
A	12	1	21	35	32	2	0	4	32	24
B	10	8	29	26	25	8	6	8	22	12
C	20	23	22	24	23	13	15	8	11	16
D	19	17	17	17	27	9	21	9	10	8
E	19	43	14	25	18	4	19	19	8	18
F	9	46	17	30	36	53	77	72	74	83
Total	89	138	120	157	161	89	138	120	157	161

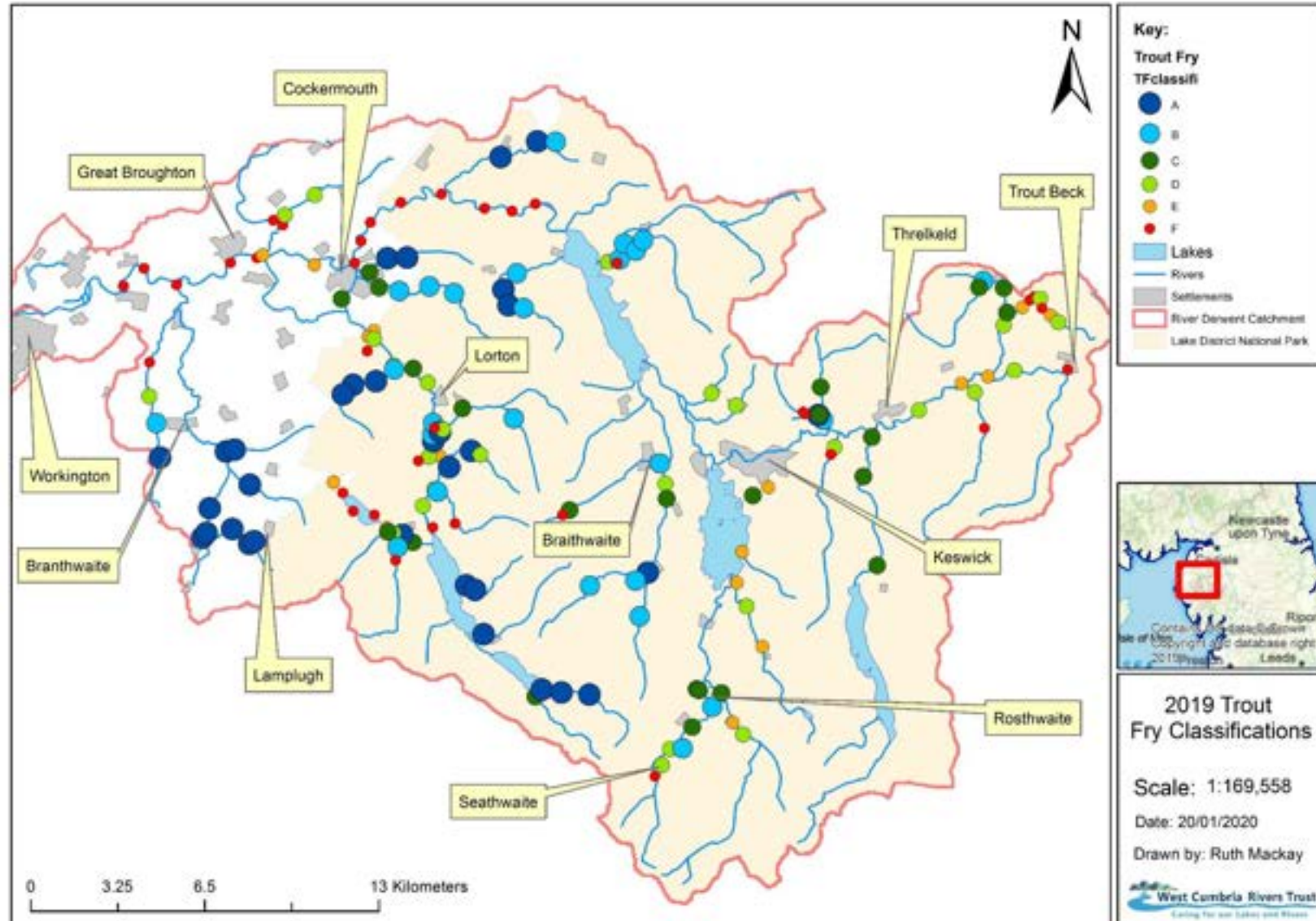


Figure 9: A map showing the 2019 trout fry classifications across the Derwent catchment.

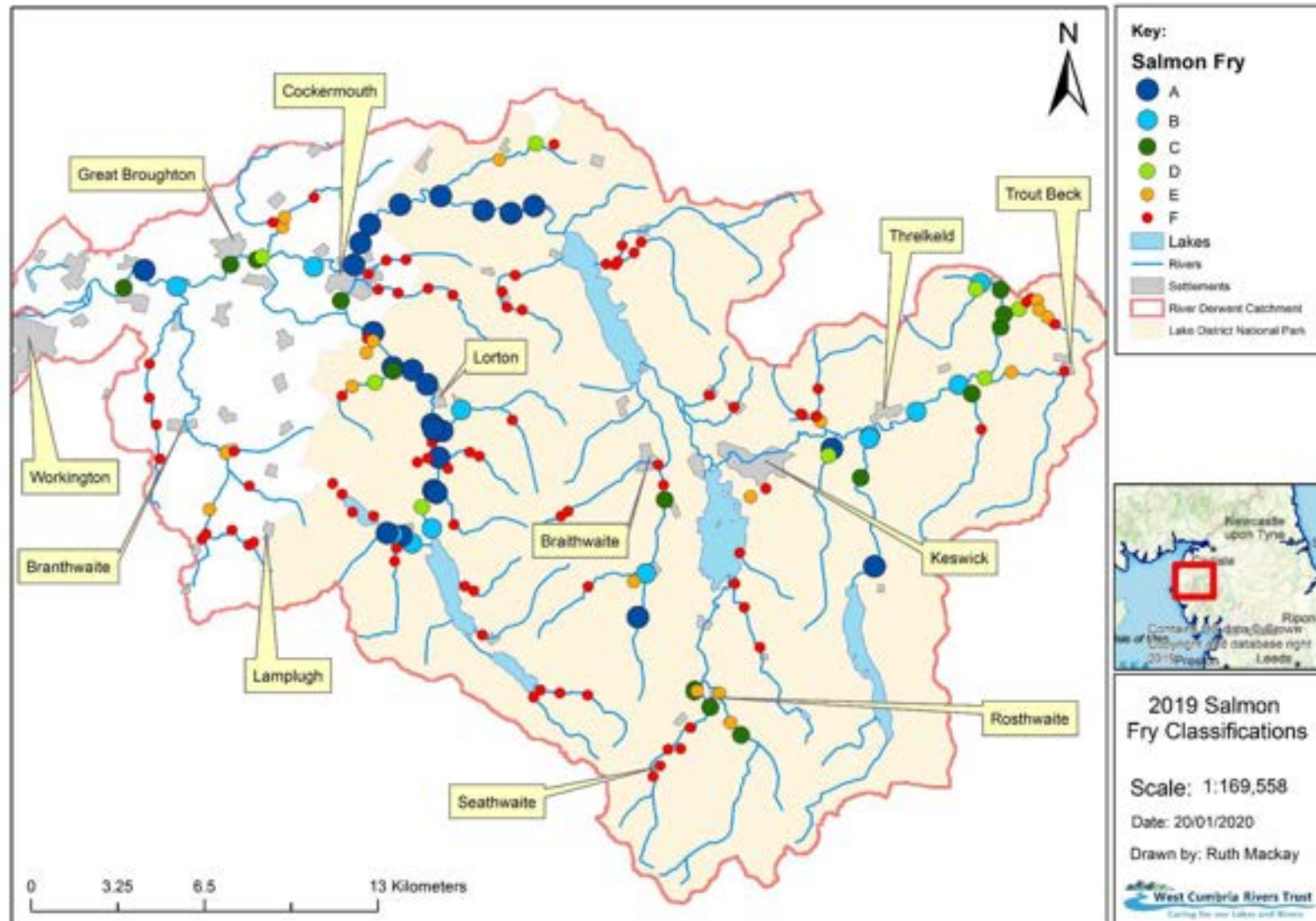


Figure 10: A map showing the 2019 salmon fry classifications across the Derwent catchment.

5 Sub-Catchment Specific Results and Discussion

5.1 Background

- 5.1.1 To discuss the results in more detail the Derwent catchment has been broken down into sub-catchments; the River Marron catchment, the River Cocker catchment, the River Greta catchment, Borrowdale - the Upper Derwent, the Derwent between Bassenthwaite Lake and Derwentwater, and finally the Derwent downstream of Bassenthwaite Lake. The different sub-catchments can be seen in Figure 11 on page 23.

5.2 River Marron Catchment

- 5.2.1 The River Marron is a major tributary of the Derwent and its headwaters are a collection of small tributaries that arise near the village of Rowrah. Colliergate Beck, Smithy Beck and Scallow Beck converge to form the Marron around the village of Asby just upstream of where Wood Beck converges with the Marron. The Marron then meanders north through the villages of Ullock, Branthwaite, Little Clifton and Bridgefoot, where it is joined by Lostrigg Beck, before flowing under the A66 and joining the Derwent.
- 5.2.2 19 sites have been surveyed within the Marron sub-catchment over the five years. In 2019, only 13 of these were surveyed and contributed 21.7% of the total trout fry recorded and just 0.1% of the total salmon fry recorded.
- 5.2.3 Figure 12 on page 24 is a map of the River Marron catchment and shows the location of the survey sites within the catchment and their corresponding site numbers.



Figure 11: A map showing the Derwent catchment which has been divided into sub-catchments to aid discussion of results within this report.

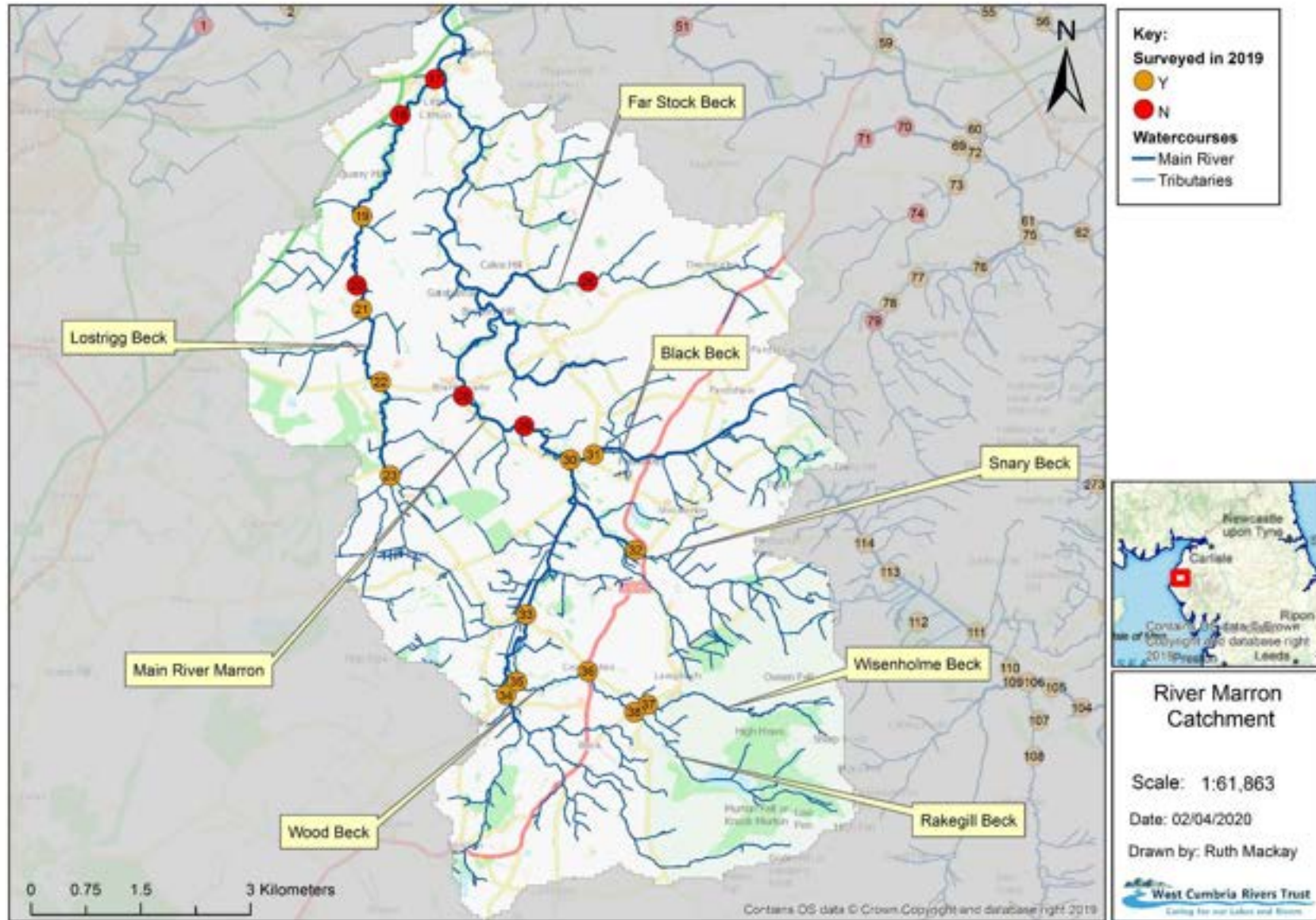


Figure 12: A map of the River Marron catchment with the location of all the surveys sites and their site numbers.

Lostrigg

5.2.4 The Lostrigg is a tributary of the Marron and arises off Dean Moor and flows parallel to the Marron before joining the Marron in the village of Bridgefoot. The Lostrigg is included in the surveys with several sites along its watercourse because fish numbers on this watercourse should be better than they are, so it is being monitored. Due to the survey results, walkover surveys have been conducted to get a more complete picture of what's going on; these show that the habitat overall is good for fish, however it could be improved in places. It would appear the main reason for poor fish numbers on the Lostrigg is down to intermittent farm pollution.

5.2.5 Table 5 shows that salmon fry are practically non-existent on the Lostrigg and have only been recorded here once in 2017 at site number 22, with all the other sites across the five years being assigned F grades for absence. Trout fair a little better but numbers could be even greater; downstream of site 21 no trout fry have recorded since 2016, but at the upstream sites above Lostrigg High Bridge, the number of trout fry has increased over the five years.

Table 5: Fish per minute results for all the sites on Lostrigg Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent												
B = Good												
C = Moderate												
D = Fair												
E = Poor												
F = Absent												
Not surveyed												
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Lostrigg Beck	17	Bridgefoot		0.6		0.0			0.0		0.0	
	18	above Bridgefoot	0.6					0.0				
	19	Capel How				0.0	0.0				0.0	0.0
	20	Stargill Bridge		0.4	0.0	0.0			0.0	0.0	0.0	
	21	Stargill Woods					1.0					0.0
	22	Lostrigg High Bridge		2.2	0.4	3.6	3.2		0.0	0.2	0.0	0.0
	23	Branthwaite Rigg		0.2	1.0	1.4	4.8		0.0	0.0	0.0	0.0

Main River

- 5.2.6 The main river Marron has had five different survey sites over the years. Most of these sites are towards the upper part of the watercourse because the EA have a regular monitoring site around Calva Hall and because the Marron is a main river it can be difficult to survey. It is proposed to add more sites to the lower part of the Marron next year.
- 5.2.7 The main river is usually good for both salmon and trout fry and as shown in Table 6, both have had grades of A-D over the five years. The number of trout fry have increased over the five years with the greatest numbers recorded in 2019. However, the salmon fry have increased up to 2018 and then decreased in 2019, which is concerning. A lot of residents and landowners who live along the Marron, did report that the water was brown and turbid for most of winter, which may have had an impact, but if this was the case, a similar decrease in trout numbers would be expected, which isn't the case.

Table 6: Fish per minute results for all the sites on main River Marron across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
			A = Excellent	B = Good	C = Moderate							
			D = Fair	E = Poor	F = Absent	Not surveyed						
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
River Marron	28	Branthwaite Fish Farm	1.0	1.0	2.2	2.4		2.6	1.4	3.6	4.8	
	29	Between Branthwaite and Ullock	3.8					0.0				
	30	Ullock Bridge	1.4	1.0		3.4	5.0	1.0	1.8		10.2	0.2
	33	Woodend Bridge		2.6			10.0		1.2			0.4
	34	Lanefoot Bridge		1.6		13.6	9.6		0.4		0.6	0.0

Marron Tributaries

5.2.8 The Marron has many smaller tributaries and most of them are surveyed even if only the one site. These include: Black Beck (site 31), Wood Beck (sites 35 and 36), Rakegill Beck (site 38), Wisenholme Beck (site 37), Snary Beck (site 32) and Far Stock Beck (site 26). The tributaries tend to be good for trout and poor for salmon, though Wood Beck can be good for salmon, but only up to Gatra Farm, where fish passage is impeded by a manmade barrier and just resident non-migratory trout are present upstream of this.

5.2.9 Table 7 shows the results for the Marron tributaries for the last five years. Trout fry have increased over the years with good values and grades of A in the latter two years. Salmon fry have been absent with grades of F, or present at a few sites but in low numbers, bar the site below the barrier at Gatra Farm which increased in number up to 2018, and then plummeted to zero in 2019. Some pollution was found at this site during the 2019 survey season but again it does not appear to have affected the trout numbers as would be expected.

Table 7: Fish per minute results for all the sites on the Marron tributaries across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute					
A = Excellent	B = Good	C = Moderate											
D = Fair	E = Poor	F = Absent	Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
Far Stock Beck	26	Woodside	6.2					0.0					
Black Beck	31	Smithy Bridge		3.0		9.4	8.0		0.2		0.0	0.0	
Snary Beck	32	Snary Beck Bridge	4.8	1.6			8.4	0.0	2.0			0.0	
Wood Beck	35	Gatra		1.8	4.0	7.4	14.4		1.0	4.6	11.4	0.0	
	36	Crossgates		1.2	2.2	4.8	5.4		0.0	0.0	0.0	0.0	
Wisenholme Beck	37	Fitz Bridge		1.2		8.6	10.4		0.0		0.0	0.0	
Rakegill Beck	38	Inglenook Caravan Park		3.4	3.6	9.8	12.8		0.0	0.0	0.0	0.0	

5.3 River Cocker Catchment

- 5.3.1 The Cocker is a major tributary of the Derwent, joining the Derwent at the town of Cockermouth. The River Cocker arises on the Buttermere Fells as several tributaries which flow down towards Buttermere and Crummock Water and emerge out of Crummock Water as the River Cocker. Park Beck which flows out of Loweswater also flows into Crummock Water adding to the headwaters of the Cocker, before the Cocker meanders north through the Lorton Valley.
- 5.3.2 A total of 77 sites have been surveyed within the Cocker sub-catchment across the five years. Of the 77, 56 sites were surveyed during the 2019 survey season and overall they contributed 48.7% of the total trout fry recorded and 40.7% of the total salmon fry recorded.
- 5.3.3 Figure 13 and 14 are maps of the River Cocker catchment and show the location of the survey sites within the catchment and their corresponding site numbers. Because the catchment is so big it had to be split into two maps, Figure 13 shows the lower or downstream part of the catchment and Figure 14 shows the upper or upstream part of the catchment.

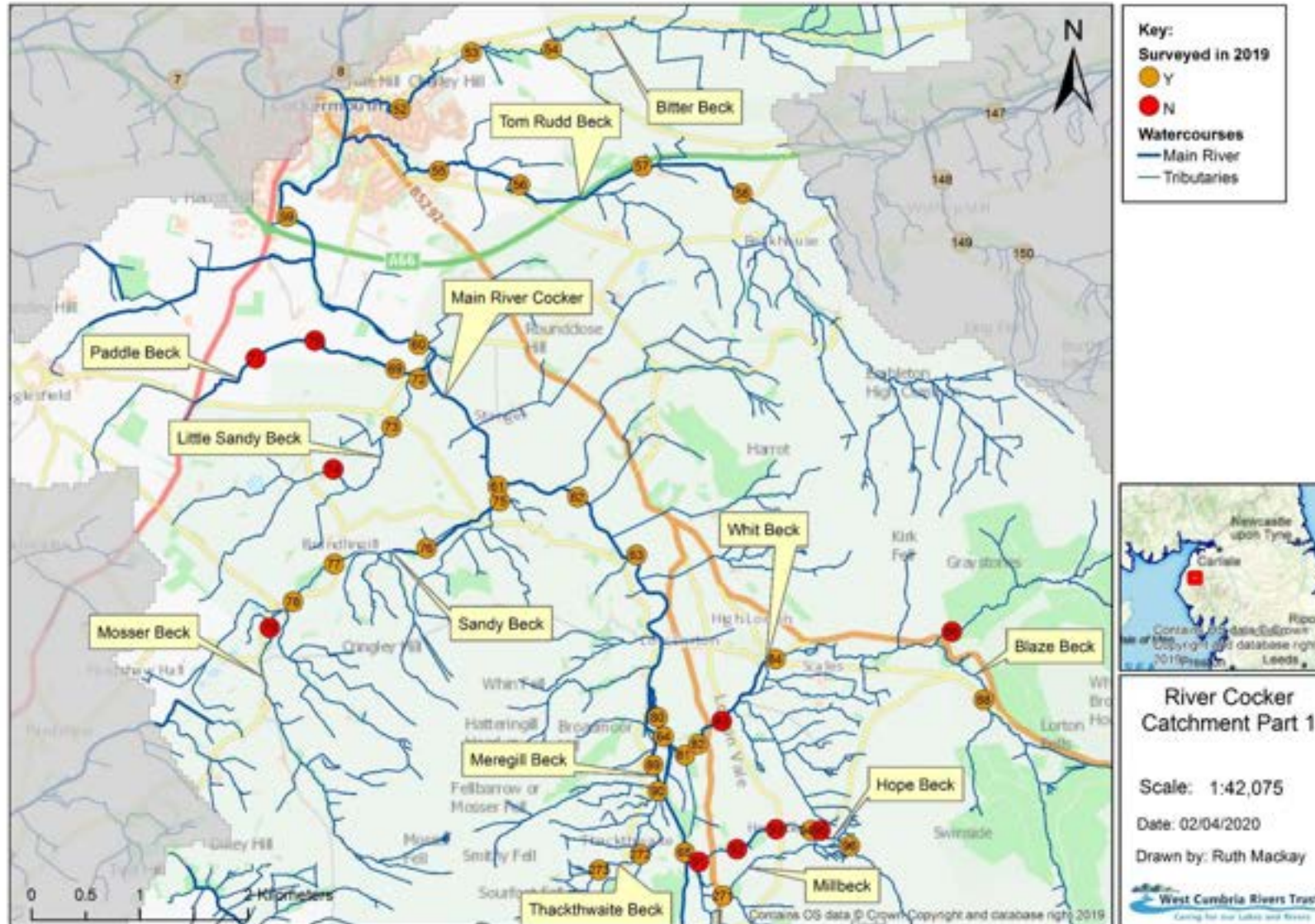


Figure 13: A map of the River Cocker catchment with the location of all the surveys sites and their site numbers. The Cocker catchment is so large it has been split into two parts for the maps, this is Part 1 and the downstream section of the catchment.

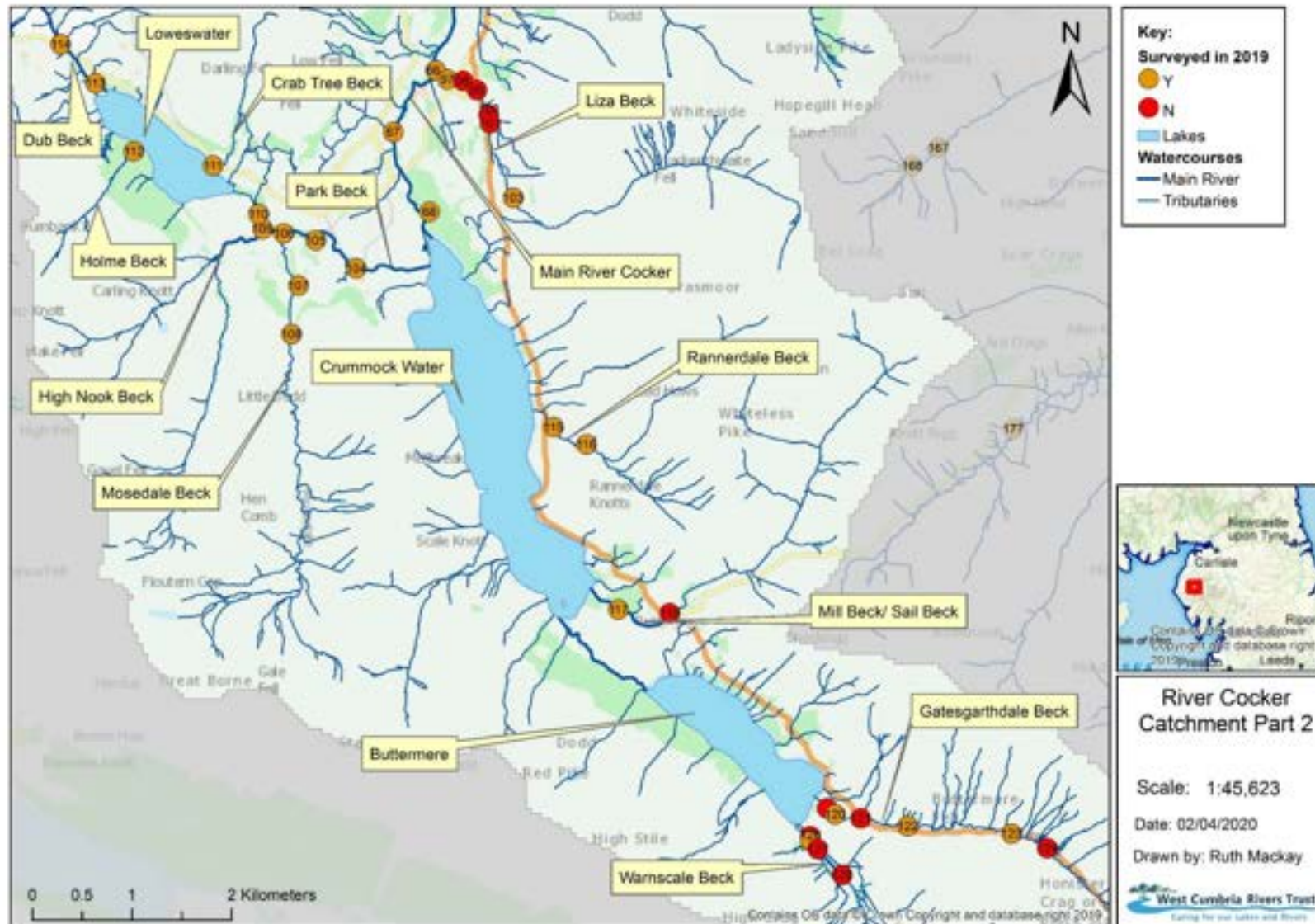


Figure 14: A map of the River Cocker catchment with the location of all the surveys sites and their site numbers. The Cocker catchment is so large it has been split into two parts for the maps, this is Part 2 and the upstream section of the catchment.

Main River Cocker

5.3.4 The ten main River Cocker sites alone contributed 24% of the total salmon fry recorded in 2019, which is reflected in the classifications of excellent and graded A, which is shown in Table 8 for most of these sites. Only a couple of sites out of the ten got grades less than A, as the habitat at these sites was slightly more suited to trout fry. On the whole, numbers of trout fry and salmon fry have increased over the five years at these sites, with salmon fry thriving in particular.

Table 8: Fish per minute results for all the sites on the main River Cocker across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent												
B = Good												
C = Moderate												
D = Fair												
E = Poor												
F = Absent												
Not surveyed												
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
River Cocker	59	Oakhurst					1.6					1.4
	60	Southwaite		0.0		0.4	0.4	1.2			13.4	11.6
	61	d/s Sandy Beck		0.0		0.4	1.0	2.4			27.4	10.8
	62	Rogerscale				0.4	1.2				19.0	13.6
	63	Low Lorton		0.0		1.0	0.6	0.6			6.4	10.8
	64	Hullary Wood					0.0					19.0
	65	Hope Beck conf				1.8	0.4				15.4	22.4
	66	Liza Beck conf		0.0		0.4	1.0		2.8		19.6	10.0
	67	Scale Hill					0.6					0.6
	68	Lanthwaite Wood		0.0		0.0	0.0		1.2		5.0	3.2

Gatesgarth & Warnscale Becks

- 5.3.5 Gatesgarth and Warnscale are two tributaries at the head of the catchment which run down off the Buttermere Fells and into Buttermere. Warnscale has been heavily modified in the past and is incredibly straight, but is now no longer maintained and slowly starting to re-naturalise as the land adjacent is now being managed as wet meadow. However, it suffers greatly from acidity which is either from a natural source or old mine works somewhere in the headwaters. Gatesgarth runs alongside the road that comes down from Honister Pass. It has good substrate provision but would benefit from some provision of shade from trees.
- 5.3.6 Salmon are not found in either of these tributaries, but both contain trout. Warnscale is host to some very small trout. Each time Warnscale has been surveyed the trout fry have been significantly smaller than other trout fry recorded within the catchment. Typically, Warnscale trout fry are around 30-40mm whereas downstream or on Gatesgarth they can be 50-80mm. Table 9 on page 33, shows the fry per minute values for these sites across the five years of surveys. All the salmon fry are graded F as they are absent at all these sites, and trout fry appear to have maintained or increased their numbers over the five years. Gatesgarth sites are 119 - 124, and Warnscale sites 125 -128.

Mill Beck

- 5.3.7 Mill Beck or otherwise known as Sail Beck, flows off Sail Fell or Eel Crag and down between Whiteless Pike and Knott Rigg before flowing into the village of Buttermere and then onto Crummock Water.
- 5.3.8 Again this is another tributary which contains trout but not salmon. Only one site is regularly surveyed as sites above Buttermere village are tricky to access due to the steep topography and bedrock geology. As shown in Table 9 on page 33, no salmon fry are present and therefore graded F across the five years. Trout fry are present and appear to have increased in numbers across the five years and graded A-C.

Rannerdale Beck

- 5.3.9 Rannerdale Beck is a small tributary that flows off Whiteless Pike and into Rannerdale valley where it converges with Squat Beck and flows north west down Rannerdale valley and into Crummock Water. Rannerdale Beck is a new addition to the survey programme at the request of the National Trust and therefore there is only one years' worth of data for these sites as they were surveyed for the first time during the 2019 survey season. No salmon fry are present as shown in Table 9 on page 33, by grades of F. However, trout fry are present in abundance and graded A.

Table 9: Fish per minute results for all the sites on Gatesgarth, Warnscale, Mill and Rannerdale Becks across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate										
D = Fair	E = Poor	F = Absent	Not surveyed									
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Gatesgarth Beck	119	d/s of Gatesgarth Farm	0.6					0.0				
	120	Gatesgarth Farm	4.0	1.4		4.8	5.4	0.0	0.0		0.0	0.0
	121	Car park	4.8					0.0				
	122	u/s of Weir	4.0	0.6		6.0	4.8	0.0	0.0		0.0	0.0
	123	Honister Pass	5.6	2.2		11.6	12.4	0.0	0.0		0.0	0.0
	124	u/s of the bridge	1.0					0.0				
Warnscale Beck	125	d/s of Peggy's Bridge	0.2					0.0				
	126	Peggy's Bridge	0.0	1.8		2.0	2.0	0.0	0.0		0.0	0.0
	127	Warnscale Plantation	0.0	1.4		2.2		0.0	0.0		0.0	
	128	u/s of Plantation	0.6					0.0				
Mill Beck	117	Long How/ Buttermere			4.6	3.8	9.8			0.0	0.0	0.0
	118	U/s of Buttermere village			1.8				0.0			
Rannerdale Beck	115	Rannerdale House/Farm					17.8					0.0
	116	Rannerdale - upper					16.2					0.0

Loweswater

- 5.3.10 Loweswater and its tributaries all flow into Park Beck which then flows into Crummock Water. The Loweswater Care Programme is a project to improve the water quality of this water body, working with local farmers and landowners in reducing the amount of nutrients entering the lake, which were causing extensive algal blooms. Although the project has currently come to the end of its funding, ongoing monitoring is still occurring and this includes fish surveys conducted as part of the River Derwent fish and habitat survey project. Over the five years monitoring has occurred on three tributaries; Holme Beck (site 112), Crabtree Beck (site 111) and Dub Beck (sites 110, 113 & 114). Dub Beck converges with High Nook Beck which then becomes Park Beck which flows east into Crummock Water. In 2019, several more survey sites were added to the area on Park Beck (sites 104-106), High Nook Beck (site 109) and Mosedale Beck (sites 107-108) as part of the new WCRT led Cocker Catchment Natural Flood Management (NFM) project funded by DEFRA/ EA and a Water Environment Grant from the European Agricultural Fund for Rural Development.
- 5.3.11 Table 10 on page 35, shows that over the five years, salmon are scarce upstream of the lake, with only one salmon being recorded on Crabtree Beck in 2017. However, downstream of the lake, salmon are present on Park Beck and High Nook Beck and in 2019 large numbers of salmon fry were recorded which shows in their grades of A and B. Mosedale Beck which is a tributary of Park Beck had no salmon fry present but did have plenty of trout fry at the lower site (site number 107) of the two. The upper site (site number 108) on Mosedale Beck didn't have any trout fry present as reflected by a grade of F, but did have trout parr present which can be seen in Appendix B. Trout fry were also present at the other new sites to varying degrees and do have a presence upstream of the lake but this varies from year to year with good and bad years.

Table 10: Fish per minute results for all the Loweswater and tributaries sites, across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
Watercourse	Site Number	Site Name										
Park Beck	104	Park Bridge		1.2		1.0	2.2		0.0		3.6	3.4
	105	Church Bridge					5.0					8.2
	106	Kirkgill Wood					0.8					7.8
Mosedale Beck	107	By Earthworks					4.0					0.0
	108	Upper Mosedale					0.0					0.0
High Nook Beck	109	High Nook					1.6					9.4
Crabtree Beck	111	Crabtree Beck		1.4	1.4	0.2	0.0		0.0	0.2	0.0	0.0
Holme Beck	112	Holme Wood		0.2	1.0	0.0	0.0		0.0	0.0	0.0	0.0
Dub Beck	110	Maggie's Bridge	0.0	1.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0	0.0
	113	Hudson Place	0.4	0.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
	114	Graythwaite	1.6	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0

Liza Beck

- 5.3.12 Liza Beck is a tributary of the River Cocker, it arises off the back of Wandope and Eel Crag, then flows over Brackenthwaite Fell down between the fells Grasmoor and Whiteside. Once it gets to the valley bottom it flows north alongside the road (B5289) before going under the road at High Liza Bridge and Low Liza Bridge to converge with the Cocker just North of Cornhow Farm.
- 5.3.13 Liza Beck is a very sediment rich system with a huge bedload compared to the size of the watercourse. It is also very flashy, meaning water levels rise and fall quickly, and during flood events regularly mobilises sediment making the bed unstable and therefore providing poor spawning habitat. There is also a barrier to fish migration at Low Liza Bridge. Under the bridge is a layer of concrete protecting a water mains pipe, but over time the bed of the beck has lowered and there is now a large drop between the concrete cap and the river bed. Fish and eel passage was addressed by WCRT in 2011, but post Storm Desmond the fish passage has deteriorated.
- 5.3.14 Salmon fry are not found upstream of this barrier to fish passage, but are found downstream. Some salmon fry were relocated from the main river to upstream of this barrier in the summer of 2019 by the EA, and is something to bear in mind when interpreting the results in future years. Trout fry can be found upstream of the barrier, and they have varied over the years. No fish were recorded at site 103, Peel Place, as there is another barrier to fish migration here and above the barrier the river bed is very active and mobile following Storm Desmond.
- 5.3.15 Table 11 on page 37, shows the number of fry per minute recorded for the five years of surveys. At the lower site on Liza Beck, salmon fry numbers have increased, whilst trout fry numbers have maintained with a dip in 2016, post floods. At the other sites, trout fry numbers vary between poor and excellent (A-E).

Hope Beck

- 5.3.16 Another tributary of the Cocker, Hope Beck arises off the back of Whiteside, Hopegill Head and Ladyside Pike. It then flows off the fells in a NW direction through the hamlet of Hopebeck named after the watercourse and then west until it meets the Cocker around Newhouse Wood.
- 5.3.17 Hope Beck, like Liza Beck, suffers with spawning success due to mobile sediments especially during flood events. It also suffers from man's influence and has been straightened in parts and is periodically dredged due to its large sediment yields.
- 5.3.18 Table 11 on page 37, shows that salmon fry have been recorded on Hope Beck but mainly at the lower few sites. Trout fry are present at all the sites surveyed to varying degrees over the years. In 2019, only two of the six sites on Hope Beck were surveyed and these were towards the top of the watercourse as the EA conducted surveys at sites in the lower part of the watercourse. No salmon fry were recorded at these two sites but trout fry were, less at the site on the fell, but good numbers at site 94.
- 5.3.19 As well these two sites, a new additional site (site 271) was conducted in 2019 on a small tributary of Hope Beck called Millbeck that works are proposed on as part of the Cocker Catchment NFM project. Good numbers of trout were also recorded here but no salmon fry were present.

Table 11: Fish per minute results for all the sites on Liza and Hope Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute					
A = Excellent	B = Good	C = Moderate											
D = Fair	E = Poor	F = Absent	Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
Liza Beck	97	Low Liza Bridge	2.8	0.2	2.6	2.4	4.6	4.0	0.8	7.6	12.8	10.8	
	98	between bridges	1.2					0.0					
	99	High Liza Bridge		0.4		6.2			0.0		0.0		
	100	d/s Beck House	1.4					0.0					
	101	Beck House	0.2		1.0	1.0		0.0		0.0	0.0		
	103	Peel Place	0.2				0.0	0.0				0.0	
Hope Beck	91	Hopebeck Bridge	4.8	0.8	4.4	5.6		2.4	0.6	0.6	0.0		
	92	Ashlands Wood	2.6					0.0					
	93	Hopebeck House			16.8					0.2			
	94	u/s Hopebeck House	6.2	1.4			5.0	0.0	0.0			0.0	
	95	u/s The Hope	2.0					0.0					
	96	On the fell			2.6	2.0	0.8				0.0	0.0	0.0
Millbeck	271	d/s of Millbeck House					5.4					0.0	

Whit Beck

- 5.3.20 Whit Beck is another tributary of the Cocker. Following extensive restoration works undertaken by West Cumbria Rivers Trust, the Environment Agency and Natural England to create 1200m of watercourse with high habitat quality in 2014, the lower reach now forms a vital salmon and trout spawning tributary in this catchment. On many OS maps Whit Beck in the lower reaches of this watercourse is still depicted in its old course as a straight line that enters the Cocker at a 90° angle but now it has been restored to a more natural meandering river.
- 5.3.21 The River Derwent fish and habitat survey project only started in 2015, but Whit Beck was built into the survey programme to monitor fish numbers post-restoration in this particular tributary. The river is still adjusting and settling into its new channel and the second site is where it has changed the most, with lots of sediment deposition and therefore at this particular site the habitat isn't as suitable for salmonid fry as the other two sites, but minnows and sticklebacks are present in abundance.
- 5.3.22 As well as the three sites within the restoration project area, there are three other sites upstream that are regularly surveyed, one in the village of High Lorton next to the road and two up on the two tributaries that converge to form Whit Beck. The left tributary being Aiken Beck that comes down through Whinlatters' Darling How Plantation and over Spout Force waterfall, the right tributary being Blaze Beck which flows off the back of Grisedale Pike and Ladyside Pike and then runs alongside Whinlatter Pass.
- 5.3.23 Table 12 on page 39 shows that salmon fry can be found at the lower four sites out of the total six surveyed regularly. No salmon fry have been recorded at the two uppermost sites. Salmon fry numbers have been pretty consistent across the five years of surveying with a slight dip in 2016 following Storm Desmond. Only Site 81 the numbers have decreased slightly in 2019 probably due to the morphological changes described above, however at this site whilst salmon numbers have dropped slightly, the number of trout fry recorded has increased. At the other sites, the numbers of trout fry have varied across the years.

Meregill Beck & Thackthwaite Beck

- 5.3.24 Meregill is a smaller tributary of the Cocker, and arises on Smithy Fell, before flowing north east, then north before joining the Cocker just upstream of the new confluence of the Cocker and Whit Beck. Thackthwaite Beck is a tributary of Meregill Beck and arises also on Smithy Fell as a series of small watercourses which merge together around of the village of Thackthwaite to form the same named beck which then flows north and converges with Meregill Beck.
- 5.3.25 Meregill is on the survey programme to monitor the results of work which has been undertaken to improve the habitat by erecting riparian fencing to keep livestock out and by placing some gravels in to encourage spawning. Thackthwaite Beck was added to the survey programme in 2019 as part of the Cocker Catchment NFM project as works are proposed on it.
- 5.3.26 Table 12, on page 39 shows that for the three years that Meregill Beck (sites 89 & 90) has been surveyed, trout fry are maintaining a presence but have slightly decreased in numbers over that time, but not by much and could be down to catch efficiency as these sites are quite hard to survey due to the vegetation that grows and also certainly the upper site on Meregill Beck, the flows have been low when surveys have taken place, again making it hard to catch the fish. Salmon fry have been present in previous years, but none were recorded on either of these becks during the 2019 survey season. Thackthwaite Beck (sites 272 & 273) did have trout fry and parr present but only at the lower site of the two. The upper site due to the steep topography, and a bedrock bed, is unsuitable for fish and the survey confirmed this when no fish were found here, but is useful knowledge for NFM interventions such as leaky barriers.

Table 12: Fish per minute results for all the sites on Whit Beck , Meregill Beck and Thackthwaite Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute					
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
D = Fair	E = Poor	F = Absent											Not surveyed
Watercourse	Site Number	Site Name											
Whit Beck	80	Whit Beck 1	3.2	0.4	3.4	6.4	2.6	10.2	1.2	10.6	26.2	8.6	
	81	Whit Beck 2	1.2	1.0	8.2	1.8	5.4	2.6	4.0	5.6	4.2	2.8	
	82	Whit Beck 3	1.6	0.2	7.2	3.0	1.0	6.4	7.0	13.2	18.6	12.8	
	83	u/s of road above RRS site	2.2					12.0					
	84	Boonbeck			16.2	2.2	2.2			3.4	3.2	4.0	
Aiken Beck	86	Spout Force			1.4	7.2				0.0	0.0		
Blaze Beck	88	Blaze Beck Bridge			1.8	9.4	2.6			0.0	0.0	0.0	
Meregill Beck	89	D/S			8.8	6.4	4.4			0.8	3.4	0.0	
	90	U/S			10.2	5.4	5.8			0.0	0.6	0.0	
Thackthwaite Beck	272	Brook Farm					0.8					0.0	
	273	Fell Yat Pastures					0.0					0.0	

Paddle Beck, Sandy Beck and Little Sandy Beck

- 5.3.27 Paddle Beck, Sandy Beck and Little Sandy Beck are all small tributaries of the River Cocker in the lower parts of the catchment. Sandy Beck arises as two smaller tributaries, Cat Gill and Mosser Beck which flow off Fellbarrow in a north west direction, before converging near Blea Bank Farm to form Sandy Beck which then flows east and north east to join the Cocker. As it flows towards the Cocker it is join by many smaller watercourses such as Cleaty Gill which flow off the north side of Fellbarrow and Whin Fell. Little Sandy Beck and Paddle Beck are slightly different and don't originate off any upland, they both arises out of wet lowland areas and flow in a north east direction through farmland, before converging with the River Cocker in the village of Southwaite.
- 5.3.28 Table 13 on page 41 shows that these three tributaries are poor for salmon fry with classifications switching between poor and absent over the years particularly on Paddle Beck (sites 69 - 71) and Little Sandy Beck (sites 72 - 74). However, the lower few sites on Sandy Beck (sites 75 - 79), moderate numbers of salmon fry have been recorded here. Trout fry on the other hand seem to do reasonably well in these tributaries with numbers varying over the years. Sandy Beck has recorded the best numbers out of the three for trout fry, with numbers increasing over the five years. Little Sandy Beck shows a slight decrease in trout fry numbers but more parr were recorded here in 2019 which isn't shown in this table. Paddle Beck has the lowest numbers of trout fry, especially at the upper two sites, which is mainly due to poor habitat and intermittent farm pollution.

Table 13: Fish per minute results for all the sites on Paddle, Little Sandy and Sandy Becks across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
Watercourse	Site Number	Site Name										
Paddle Beck	69	Southwaite Green		0.4	1.0		0.2		0.0	0.4		0.0
	70	Waterloo Farm		0.0	0.2				0.2	0.0		
	71	Paddle School		0.0	0.0				0.0	0.0		
Little Sandy Beck	72	Southwaite Farm			1.0		0.8			0.0		0.4
	73	Abbeygate			2.2		0.0			0.0		0.4
	74	Sneckyeat			1.8					0.2		
Sandy Beck	75	Sandy Beck Bridge		0.4			2.4		1.2			1.8
	76	Mr G. Graham		1.2	10.0		11.8		1.0	2.6		1.2
	77	Toddell Cottage		0.4	11.8		17.2		0.0	0.8		0.4
	78	Blea Bank		1.0	9.0	2.6	18.4		0.4	0.8	0.0	0.0
	79	Aikbank Farm			1.6					0.0		

Bitter Beck & Tom Rudd Beck

- 5.3.29 Both are tributaries of the River Cocker but join the Cocker in the town of Cockermouth just before the Cocker joins the Derwent. Bitter Beck arises off Setmurphy Common and flows west through farmland before reaching the town of Cockermouth, where it runs alongside St Helens Street before being culverted under the car park and into the Cocker. Tom Rudd Beck arises on Wythop Moss behind Ling Fell, it flows north until it reaches the A66 where it has been diverted and straightened to flow alongside the A66 before going under the road and flowing parallel to Strawberry How Road on the outskirts of Cockermouth, into the town and joining the Cocker just above Victoria Road on the B5292.
- 5.3.30 Neither becks are in particularly good condition, Tom Rudd Beck suffers from regular pollution arising from farm and construction site sources. There is also poor access for fish to migrate upstream, at the confluence with the Cocker. Bitter Beck is known for drying up, especially in the lower reaches; also due to a long section of culverting through the town fish struggle to migrate upstream to spawn, despite efforts to aid fish migration through the installation of baffles.
- 5.3.31 Table 14 on page 43 shows that due to the lack of fish access to migrate upstream, no salmon fry are found on either becks and therefore assigned classifications of Absent. Trout fry on the other hand are present and the classifications have varied over the years. On Bitter Beck (site numbers 52 - 54) the numbers of trout fry recorded appear to have increased, bar site 52 which have decreased; this is mainly because during the drought in 2018, this site dried up completely and fish were killed and in 2019, they will be recovering from this. On Tom Rudd Beck, (site numbers 55 - 58) trout fry are maintaining a presence with a decrease at site 57, but still graded B which is a Good classification.

Table 14: Fish per minute results for all the sites on Tom Rudd Beck and Bitter Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
Watercourse	Site Number	Site Name										
Bitter Beck	52	Waste Lane		0.2	10.8		2.2		0.0	0.0		0.0
	53	St Helen's Cottage				1.4	5.4				0.0	0.0
	54	St Helen's Bridge		2.0		6.0	9.4		0.0		0.0	0.0
Tom Rudd Beck	55	Strawberry How		0.2	1.8	0.2	1.4		0.0	0.0	0.0	0.0
	56	Strawberry How Farm		0.2	2.8	1.6	2.6		0.0	0.0	0.0	0.0
	57	Westray		0.4		12.0	2.6		0.0		0.0	0.0
	58	Lingarth		0.4	3.2	2.6	3.6		0.0	0.0	0.0	0.0

5.4 River Derwent downstream of Bassenthwaite Lake

- 5.4.1 This sub-catchment is the section of the main river Derwent and any tributaries that flow into it from the bottom of Bassenthwaite Lake to the sea at Workington, not including the major tributaries such as the Cocker and the Marron. It includes smaller tributaries such as Broughton Beck, Blumer Beck, Coal Beck, Wythop Beck, Dash and Chapel Beck as well as the sites on the main river Derwent itself.
- 5.4.2 Within this sub-catchment a total of 59 sites have been surveyed across the five years. Of the 59 sites, 32 were surveyed during the 2019 survey season and they contributed 12.8% of the total trout fry recorded and 38.8% of the total salmon fry recorded.
- 5.4.3 Figures 15 and 16 on pages 45 and 46 are maps of the River Derwent downstream of Bassenthwaite Lake sub-catchment and show the location of the survey sites within the catchment and their corresponding site numbers. Because the sub-catchment is so big it had to be split into two maps, Figure 15 shows the lower part of the catchment downstream of the town of Cockermouth and Figure 16 shows the upper part of the catchment, between the lake and Cockermouth.

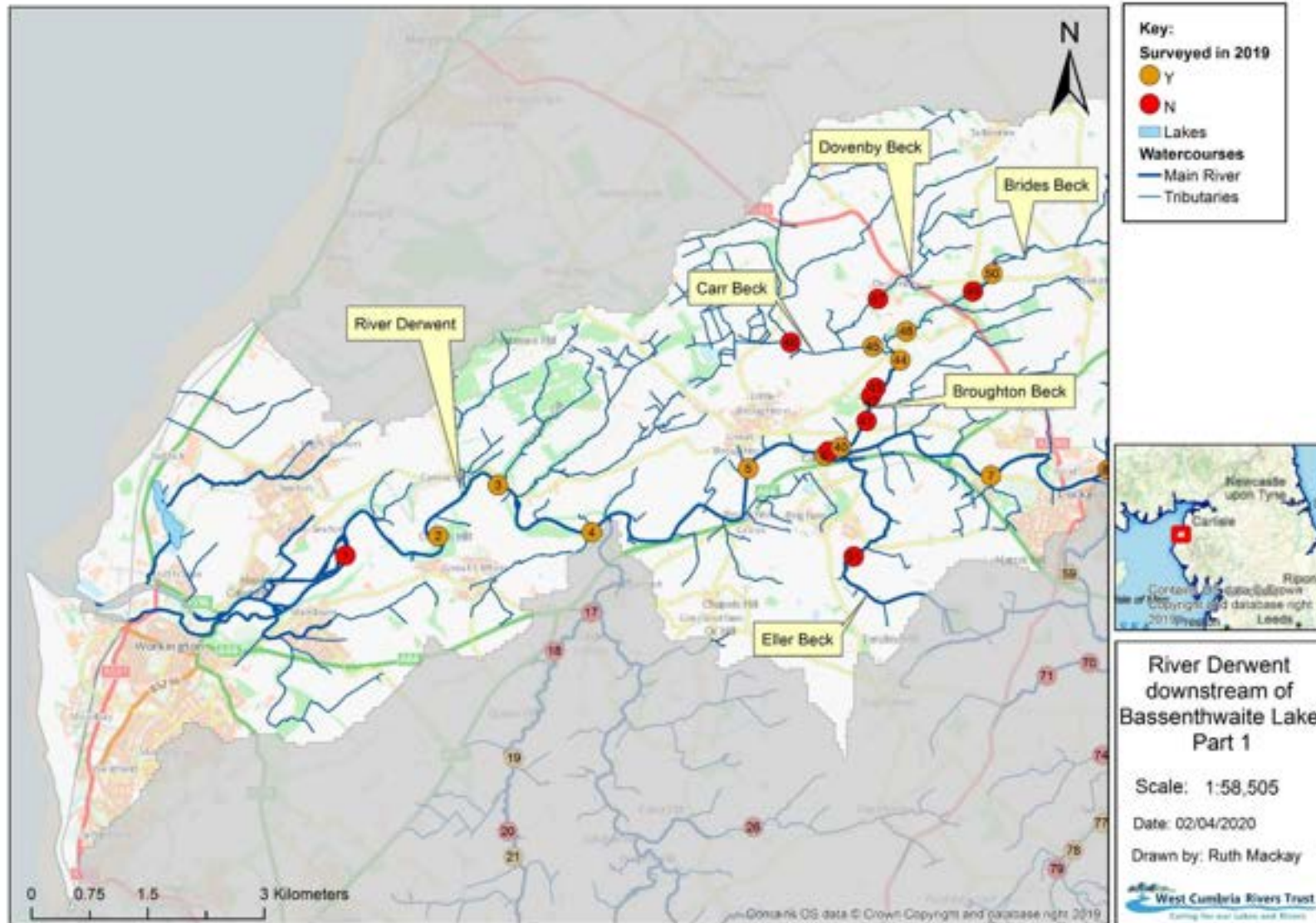


Figure 15: A map of the River Derwent and tributaries downstream of Bassenthwaite Lake with the location of all the survey sites and their site numbers. This sub-catchment is so large it has been split into two parts for the maps, this is Part 1 and is the section downstream of the town of Cockermouth.

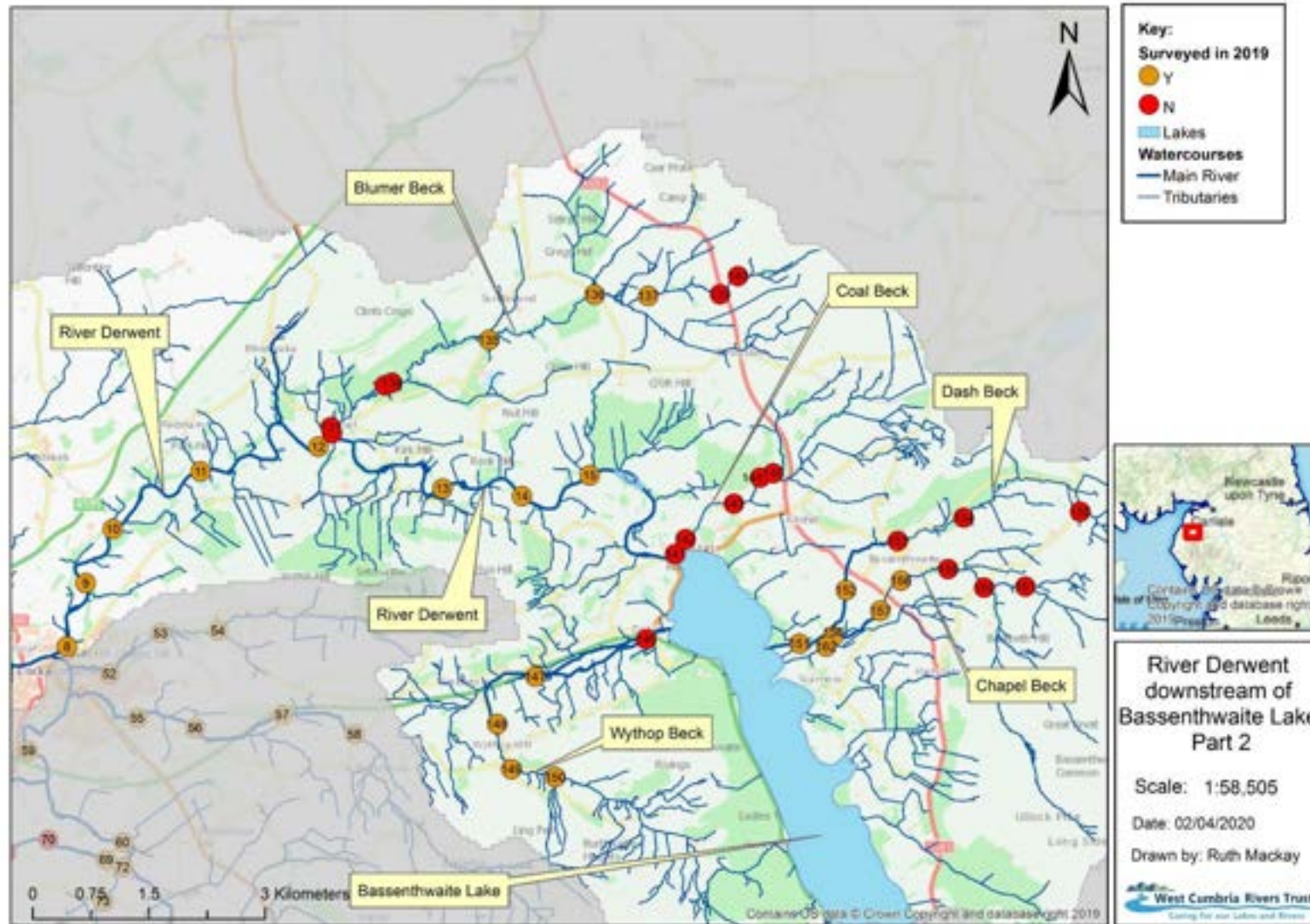


Figure 16: A map of the River Derwent and tributaries downstream of Bassenthwaite Lake with the location of all the surveys sites and their site numbers. This sub-catchment is so large it has been split into two parts for the maps, this is Part 2 and is the section between Bassenthwaite Lake and the town of Cockermouth.

Main River

- 5.4.4 This section of the main river Derwent covers the exit of Bassenthwaite Lake to the sea at Workington. The 14 sites are almost evenly spaced out along this section from the most upstream one at a favourite fishing spot for anglers, Brock Hole, to the most downstream site just downstream of Coups Weir.
- 5.4.5 The 14 main river Derwent sites alone produced 38.1% of the total salmon fry recorded during the 2019 survey season. Again showing that the main River Derwent downstream of Bassenthwaite Lake is possibly one of the most fruitful sections in terms of salmon fry numbers and how important the main river is for salmon fry and why it is designated an SAC and SSSI. The good salmon results from the main river sites also highlight just how important the tributaries are to the trout, as trout fry aren't thriving in the main river with few or none found at most of the 14 main river sites. This is probably due to being out competed by the salmon or the habitat just not being quite as suitable.
- 5.4.6 Table 15 on page 48, is a summary of the fish per minute values and their classifications for the 14 main river sites on the River Derwent below Bassenthwaite Lake, most just surveyed in 2018 and 2019, but a few were attempted in 2016.

Table 15: Fish per minute results for all the sites on the River Derwent below Bassenthwaite Lake across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent B = Good C = Moderate D = Fair E = Poor F = Absent Not surveyed			2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Watercourse	Site Number	Site Name										
River Derwent	1	Coups Weir				0.0				2.4		
	2	Camerton Church				0.0	0.0			1.2	2.8	
	3	Dangerous Wood				0.0	0.0			7.2	15.8	
	4	Ribton Hall				0.0	0.0			5.6	4.8	
	5	Oldbridge				0.0	0.0			16.4	2.2	
	6	u/s of Broughton				0.0	0.0			18.0	2.2	
	7	Cradles Papcastle		0.4		0.0	0.2		0.0	4.6	3.4	
	8	Memorial Gardens		0.0		0.0	0.0		2.0	24.6	17.6	
	9	Woodhall Park		0.0		0.0	0.0		0.6	9.0	28.2	
	10	Woodhall Farm				0.0	0.0			15.6	13.2	
	11	Redmain Hall				0.2	0.0			26.4	14.8	
	12	Isel Hall		0.0		0.0	0.0		7.2	33.6	19.6	
	13	Prior Wood		0.0		0.0	0.0		2.8	16.0	22.8	
	14	Long Close Farm					0.0				8.6	
	15	Brock Hole		0.4		0.8	0.0		0.4	17.6	8.4	

Broughton Beck

- 5.4.7 Broughton Beck is a tributary of the River Derwent, it starts as several different watercourses - Carr Beck, Dovenby Beck and Brides Beck - which all converge downstream of the village of Dovenby at Priests Bridge to form Broughton Beck which then flows south and south west before joining the Derwent upstream of the village of Great Broughton.
- 5.4.8 As Broughton Beck is a sizeable tributary with relatively good substrate and habitat and directly joins the Derwent in an area with good salmon numbers, this tributary should be a good spawning tributary for trout and salmon. However, it suffers badly from siltation and intermittent pollution affecting water quality.
- 5.4.9 Table 16 on page 50, is a summary of the fry per minute values and their classifications for all the sites surveyed on Broughton Beck across the five years. Salmon fry are found on Broughton Beck (sites 39 - 45) and some on Brides Beck (sites 48 - 50) but numbers are low leading to classifications of poor to moderate, there is also no salmon fry upstream of the first weir on Brides Beck but they are found downstream, which indicates that they are unable to migrate over this obstacle. No salmon fry have been recorded upstream of Priests Bridge on Carr Beck (site 46) and Dovenby Beck (site 47).
- 5.4.10 Trout fry have been recorded at most sites with only a few not having any present across the five years. Where trout fry are present, again numbers vary and classifications range from poor to moderate with no obvious trends.

Eller Beck

- 5.4.11 Eller Beck is a small tributary of the River Derwent, it arises out of Dubs Moss as Dubs Gutter and flows in a west, then north west direction, and becomes Eller Beck around the village of Brigham. It then flows past the village, under the A66 and joins the River Derwent upstream of Broughton High Bridge. Eller Beck is known to dry up in its lower reaches as it flows through limestone bedrock and can flow subterranean.
- 5.4.12 It was added to the survey programme in 2017 out of interest but a pollution incident had recently occurred and there was lots of muck in the watercourse and no salmonids were recorded during the survey. Table 16 on page 50, shows this result as the site has been classified as absent for both salmon and trout fry. However, some eels and stickleback were present during the survey, so some life had survived and the habitat at the site was good so hopefully fish numbers can recover. The site has not been surveyed since as it has not been a priority.

Table 16: Fish per minute results for all the sites on Broughton Beck and Eller Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate										
D = Fair	E = Poor	F = Absent										
		Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Broughton Beck	39	u/s of confluence	0.0					0.4				
	40	Along footpath	0.2	0.2	0.0	0.8	0.4	0.6	0.0	1.2	2.2	1.0
	41	Derwent House Farm	1.8					2.2				
	42	Quarries	0.8	0.0	0.4	1.0		2.6	0.0	1.8	2.2	
	43	u/s of Quarries	0.4					0.8				
	44	Priests Bridge	0.4	0.0	0.4	0.2	0.0	0.2	1.8	1.4	0.2	0.2
	45	Station Wood			0.2	0.2	0.0			0.0	0.0	0.0
Carr Beck	46	d/s of road		0.0					0.0			
Dovenby Beck	47	Track to UU treatment works		0.0	0.0				0.0	0.0		
Brides Beck	48	Dovenby Wood				1.8	1.0				1.0	0.4
	49	Dovenby Mill		0.0	2.2	0.4			0.0	0.0	0.0	
	50	Dovenby Sawmill				0.0	0.8				0.0	0.0
Eller Beck	51	Ellerbeck Farm and Fisheries		0.0					0.0			

Blumer Beck

- 5.4.14 Blumer Beck arises off Binsey and the surrounding fells as three small tributaries; Black Beck, Scalegill Beck and Bewaldeth Beck. All three tributaries flow under the A591 and then Scalegill Beck and Bewaldeth Beck converge just downstream of Scalegill Farm and then they converge with Black Beck at Beckgrains Bridge to form Blumer Beck. Blumer Beck then flows south west before joining the River Derwent at Isel Hall.
- 5.4.15 Nine sites have been surveyed on Blumer Beck in total over the five years, however, only three have been surveyed regularly. Due to access issues because of the construction works for United Utilities West Cumbria Supply Project the lower sites haven't been surveyed for a few years. Also upstream of the A591 no fish were recorded when these sites were surveyed which leads to suspicions that the road crossing is causing a barrier to fish passage, but this needs clarifying by conducting a walkover survey.
- 5.4.16 Table 17 shows that salmon fry can be found on Blumer Beck as far up as Beckgrains Bridge and the classifications for salmon fry have varied over the years between moderate and poor. Trout fry can be found further up at Scalegill Farm and have slightly higher numbers than salmon. Classifications for trout fry have varied across the five years with no obvious trend, but numbers are good with lots of A and B grades.

Table 17: Fish per minute results for all the sites on Blumer Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent												
B = Good												
C = Moderate												
D = Fair												
E = Poor												
F = Absent												
Not surveyed												
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Blumer Beck	130	Below Road @ Isel Hall	0.6					1.8				
	131	Isel Hall	0.8	0.4				1.2	1.8			
	133	Park Wood 1	3.0					0.8				
	134	Park Wood 2	2.6					0.4				
	135	Blumer Bridge	6.0	1.6		4.8	5.8	0.0	1.8		0.6	0.2
	136	Beckgrains Bridge	8.4	2.4	8.6	4.0	5.4	0.0	0.2	1.6	1.4	1.2
Scalegill Beck	137	Scalegill Farm			5.0	7.4	4.0			0.0	0.0	0.0
	139	Layby			0.0					0.0		
	140	Above A591			0.0					0.0		

Wythop Beck

- 5.4.17 Wythop Beck arises off the back of a fell called Ladies Table that is located to the west of Bassenthwaite Lake. The beck flows through the land surrounding Wythop Hall and is then joined by a tributary that flows off the moss at the back of Sale Fell by Lothwaite Side Farm. Wythop Beck circumnavigates itself around the edge of Sale Fell, through the village of Wythop Mill and towards the A66 where it crosses underneath the road and then does a 360 and comes back under the A66 and flows alongside it towards Dubwath Silver Meadows before going back under the road towards the hamlet of Dubwath and entering Bassenthwaite Lake.
- 5.4.18 Table 18 shows that no salmon have been found on Wythop Beck at all sites across the five years. However, Wythop Beck is good for trout fry and numbers have mostly increased across the years with a slight drop in 2019, but still have good classifications.
- 5.4.19 Site number 146 at Dubwath Silver Meadows is slightly different, here the habitat is a deep glide and no fry have been found here, hence the classifications of absent for both trout and salmon fry. But that's not to say there are no fish, several large trout parr were recorded here along with a pike, roach, minnows and stickleback, in 2018. This site was not surveyed in 2019 due to time constraints.

Table 18: Fish per minute results for all the sites on Wythop Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
		Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Wythop Beck	146	Dubwath Silver Meadows		0.0	0.0	0.0		0.0	0.0	0.0		
	147	East House/Close Farm (d/s of A66)					4.0					0.0
	148	Wythop Mill (in village)		0.8	8.0	9.0	5.6	0.0	0.0	0.0	0.0	0.0
	149	u/s of village		0.4	2.8	7.4	7.2	0.0	0.0	0.0	0.0	0.0
	150	Brumston Bridge		1.2	5.8	11.6	4.6	0.0	0.0	0.0	0.0	0.0

Coal Beck

- 5.4.20 Coal Beck is a tributary of the Derwent, it converges with the Derwent at Ouse Bridge just as the Derwent leaves Bassenthwaite Lake. The source of Coal Beck is as several tributaries that drain the land around the villages of Bewaldeth and Kilnhill. The tributaries join around Burthwaite Wood and then flow south west as Coal Beck towards the Lake District Wildlife Park and Armathwaite Hall.
- 5.4.21 Coal Beck regularly features on the survey schedule as it supports both salmon and trout, however it hasn't been surveyed for the last two years due to various problems. Unfortunately, in 2019, just before survey season a major pollution incident occurred which resulted in fish kills and it was decided that surveys would not occur so that no further stress was caused to any fish remaining. Coal Beck also wasn't surveyed in 2018, as suitable conditions didn't present itself throughout the survey season due to drought and then poor visibility and high water levels.
- 5.4.22 Despite this the results for Coal Beck for the other three years can be found in Table 19. Salmon fry were increasing or maintaining a presence at most sites, with a couple of sites reaching moderate classifications in 2017. Trout fry on Coal Beck, numbers started well, dipped in 2016 due to Storm Desmond and then increased again the following year.

Table 19: Fish per minute results for all the sites on Coal Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
Watercourse	Site Number	Site Name										
Coal Beck	141	Ouse Bridge	1.8	0.2				0.0	0.2			
	142	Herdwick View Caravan Park	3.6	0.2	8.2			0.0	0.8	1.8		
	143	Lake District Animal Park	4.6	1.0	6.4			0.2	0.4	0.4		
	144	Cattle Pen	9.6	0.6	9.8	6.2		0.0	0.2	0.0	1.6	
	145	Above cattle pen	13.4					0.0				

Dash & Chapel Beck

- 5.4.23 Both these becks arise off the Skiddaw Massif. Dash Beck arises at the back of Skiddaw, out of the bog that surrounds the well-known youth hostel Skiddaw House. It then flows north west between Little Calva and Bakestall before flowing west and then south west towards the village of Bassenthwaite. Chapel Beck is slightly smaller than Dash Beck and arises off the west side of Skiddaw as several small tributaries; Southerndale Beck, Barkbethdale Beck and Cockup Gill. These three becks converge at the base of the slopes to form Chapel Beck just before Walk Mill Bridge. Chapel Beck then flows west and then south west around the outskirts of the village of Bassenthwaite before converging with Dash Beck before flowing into Bassenthwaite Lake.
- 5.4.24 Table 20 on page 55 shows the fry per minute results and the classifications for both Dash Beck (site numbers 151 - 155) and Chapel Beck (site numbers 156 - 162). Both becks have had salmon fry recorded on them over the five years but to varying degrees and in 2019 no salmon fry were recorded at any of the sites surveyed on both becks. When present salmon also tend to be found at the lowers sites on these watercourses and the trout tend to dominate further upstream (as would be expected). Trout are more prevalent on both becks with classifications ranging from excellent to poor, with most sites on both becks showing an increase in trout fry numbers or maintaining a presence.

Table 20: Fish per minute results for all the sites on Dash and Chapel Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate										
D = Fair	E = Poor	F = Absent	Not surveyed									
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Dash Beck	151	Orchard Wood				1.8	0.8				0.2	0.0
	152	Traffords Caravan Park			2.2	3.2	4.2			1.0	0.0	0.0
	153	In village		0.0	2.8				1.6	1.2		
	154	High Close Holiday Home			4.2					0.0		
	155	Mirkholme			3.4	2.2				0.0	0.0	
Chapel Beck	156	u/s of confluence				0.6	4.4				1.4	0.0
	157	Gibbeson Bridge	2.2	0.0	11.0	4.6	3.6	0.0	0.0	0.0	0.0	0.0
	158	Chapel Bridge	6.8	0.4	3.6	7.6	2.6	0.0	0.0	1.6	3.8	0.0
	159	Burthwaite		0.2	2.8	6.0			0.0	0.2	0.0	
	160	Walk Mill Bridge		0.0		6.4			0.0		0.0	
	161	Cockup Gill		0.0					0.0			
Pooley Beck	162	Pooley Beck					0.0					0.0

5.5 River Derwent between Bassenthwaite Lake and Derwentwater

- 5.5.1 This section is the bit of the main river Derwent between the two lakes, Derwent Water and Bassenthwaite and includes all the tributaries that join the river between those two areas, not including the River Greta.
- 5.5.2 In total, 36 sites have been surveyed in this sub-catchment over the last five years. During the 2019 survey season, 11 of these sites were surveyed and they contributed 5.6% of the total trout fry recorded and 3.5% of the total salmon fry recorded. The three main river sites within this sub-catchment were not surveyed this year as the river levels rose before the opportunity arose to survey this part of the overall Derwent catchment.
- 5.5.3 Figures 17 and 18 on pages 57 and 58 are maps of the River Derwent between Bassenthwaite Lake and Derwentwater sub catchment and show the location of the survey sites within the catchment and their corresponding site numbers. Because the catchment is so big it had to be split into two maps, Figure 17 shows the lowland region between the two lakes and Figure 18 shows Newland Valley, with Newlands Beck being a major tributary of the Derwent within this sub-catchment.

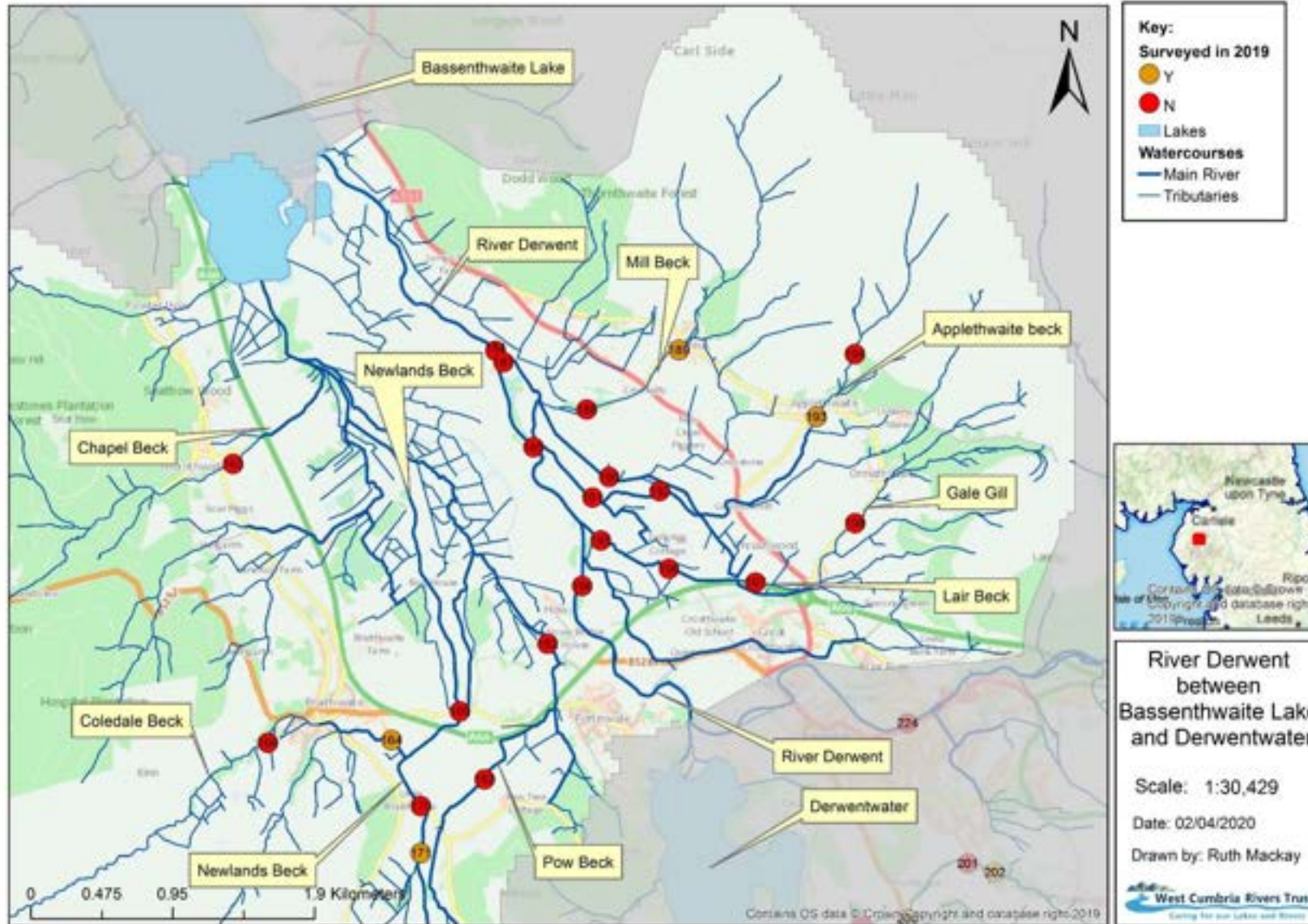


Figure 17: A map of the River Derwent and tributaries between Bassenthwaite Lake and Derwent Water, with the location of all the surveys sites and their site numbers. This sub-catchment is so large it has been split into two parts for the maps, this is Part 1 and is the section covers the lowlands between the two lakes.

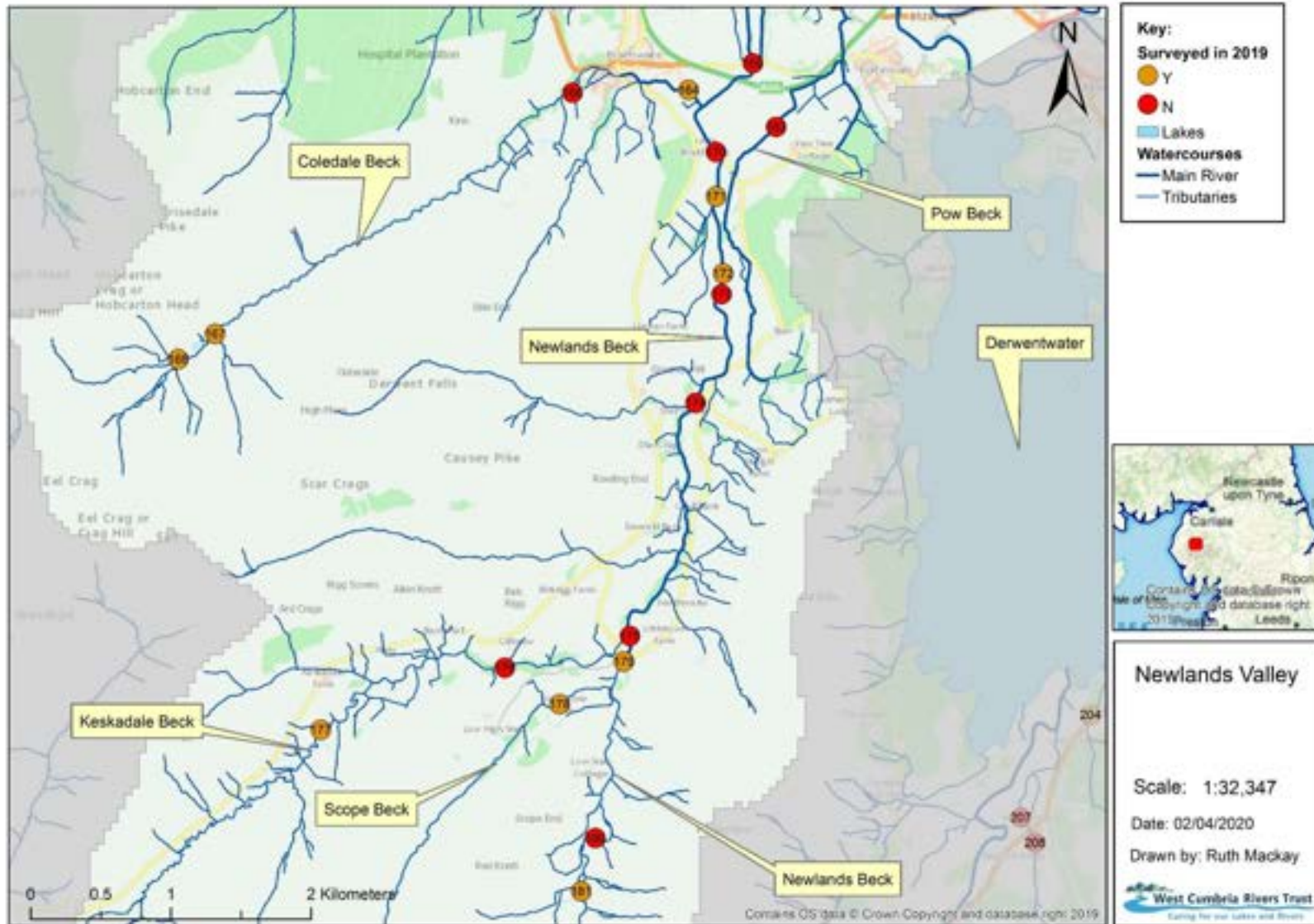


Figure 18: A map of the River Derwent and tributaries between Bassenthwaite Lake and Derwent Water, with the location of all the surveys sites and their site numbers. This sub-catchment is so large it has been split into two parts for the maps, this is Part 2 and is the section covers the Newlands Valley.

Main River

5.5.4 Table 21 shows the fry per minute results and the classifications for the three main river Derwent sites between Bassenthwaite Lake and Derwent Water. Two sites were surveyed in 2016 and two sites were surveyed in 2018. Trout fry are few and far between at these three sites, with most sites producing classifications of absent and only site, number 186 recording a few trout fry present in 2016. Salmon fry on the other hand weren't abundant here in 2016 but massively increased their numbers in 2018, with the two sites surveyed contributing 8% of the total salmon fry recorded for the 2018 season and both were graded A for excellent.

Table 21: Fish per minute results for all the sites on the main River Derwent between Bassenthwaite Lake and Derwent Water across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent												
B = Good												
C = Moderate												
D = Fair												
E = Poor												
F = Absent												
Not surveyed												
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
River Derwent	184	High Stock Bridge		0.0					0.0			
	185	Derwent Middle				0.0					17.4	
	186	How Farm		0.4		0.0			1.6		43.8	

Skiddaw Tributaries

5.5.5 The Skiddaw tributaries are a collection of tributaries that all flow off Skiddaw and into the River Derwent. They all run parallel off the fells south west before flowing north west to meet the Derwent. The tributaries from west to east are named; Millbeck, Applethwaite Gill, Burr Gill and Gale Gill, which eventually turns into Lair Beck. Millbeck and Applethwaite Gill are both heavily modified through the villages of the same names and downstream of the villages, they are straightened, perched and historically dredged. Burr Gill has reasonable habitat and is a good nursery for trout fry. Gale Gill/ Lair Beck suffers from road and forestry runoff and there is also a barrier to fish passage within Burnside Caravan Park. Like Applethwaite Gill and Millbeck, Lair Beck has also been historically dredged.

5.5.6 These tributaries are on the survey schedule because WCRT has identified river restoration opportunities on them, and requires baseline fish data. All the sites bar one were surveyed in 2017, but not all the sites have been repeated in the following years due to access issues to the lower reaches because of the construction site for the United Utilities West Cumbria Supply Project.

5.5.7 Table 22 on page 60, shows the fry per minute results and the classifications for these sites across the five years, but with most sites only having data for 2017. In 2017, salmon fry were found at the sites downstream of the A591 and downstream of the villages, but not very many and most classifications for salmon fry were poor or absent. Trout fry are found at most the sites surveyed on the Skiddaw tributaries bar the upper one on Gale Gill, and numbers have varied between sites and between the years at sites which have been surveyed more than once.

Table 22: Fish per minute results for all the sites on the Skiddaw tributaries across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
Watercourse	Site Number	Site Name										
Mill Beck	187	Dancing Gate Farm			0.8					0.2		
	188	d/s of Crookelty Bridge			1.6					0.2		
	189	Millbeck Village			2.6	3.8	0.6			0.0	0.0	0.0
Wath Beck	190	Drainage ditch			0.4					0.2		
	191	Wath Beck			0.8					0.2		
Applethwaite Gill	192	near sewage works			7.4					0.2		
	193	Applethwaite Village			2.4	4.4	0.6			0.0	0.0	0.0
	194	On fell			0.0					0.0		
Lair Beck	195	near sewage works	0.4	0.0	1.6			0.0	0.4	0.0		
	196	u/s of sewage works	1.2					1.0				
	197	Next to A66	5.2	1.2	5.6	2.2		0.0	0.0	0.0	0.2	
Gale Gill	198	Burnside Caravan Park		0.0	0.0	0.0			0.0	0.0	0.0	

Coledale Beck

- 5.5.8 Coledale Beck arises off the Derwent Fells of Eel Crag and flows down between Causey Pike, Barrow and Grisedale Pike along the Coledale Valley, through the village of Braithwaite to converge with Newlands Beck before reaching Bassenthwaite Lake. Force Crag mine is situated at the headwaters of this beck and for many years the beck has suffered from poor water quality due to mine water discharge. However, following a minewater remediation scheme, fish are making a return upstream. These surveys are therefore monitoring the re-colonisation of Coledale Beck.
- 5.5.9 Due to the steep nature of the valley, Coledale Beck regularly experiences landslides which is a source of sediment contributing to the large sediment yields and leading to very mobile substrate during flood events. For this reason, there is a gravel trap just upstream of the village of Braithwaite. The EA are responsible for the trap and regularly clear it. However, this gravel trap is a barrier to fish migration upstream and therefore above this obstacle, only resident trout are found. There is also a natural barrier to fish migration, upstream of the trap, where during Storm Desmond and the resulting landslips, a large block of rock has fallen into the river and created a small waterfall.
- 5.5.10 Therefore, no salmon are found at the sites upstream of the village and all have a classification of absent. Downstream of the village, salmon fry were recorded in 2018 but were not in 2019 or years prior to 2018. Trout fry are found upstream and downstream of the village and at most sites the trout fry have increased in number. The only site with no trout fry recorded is the one above the mine and has a classification of absent for both salmon and trout fry. The fry per minute results and the classifications for all sites on Coledale Beck across the five years are shown in Table 23.

Table 23: Fish per minute results for all the sites on Coledale Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute					
A = Excellent	B = Good	C = Moderate											
D = Fair	E = Poor	F = Absent	Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
Coledale Beck	164	Scotgate Caravan Park			1.6	1.6	3.6			0.0	6.6	0.0	
	165	In village		0.4					0.0				
	166	Braithwaite Gravel Trap				1.0					0.0		
	167	d/s Force Crag Mine		0.4	0.8	0.6	1.4		0.0	0.0	0.0	0.0	
	168	u/s Force Crag Mine		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	

Newlands Beck

- 5.5.11 Newlands Beck arises off the fell Dale Head near to Dalehead Tarn and flows north down the valley between the fells of Hindscarth, High Spy, Maiden Moor and Scope End. As it nears the village of Little Town it is joined by Scope Beck. Scope Beck arises off the Derwent Fells of Robinson and Hindscarth as Little Dale which flows down the hanging valley, over the lip between Littledale Craggs and Blea Craggs to a small tarn. Scope Beck then flows out of the tarn, northeast and down the valley between the fells of Red Knott, Scope End and High Snab Bank. Just downstream of Chapel Bridge, Newlands Beck is joined by another tributary; Keskadale Beck is a significant tributary of Newlands Beck and arises off the Buttermere Fells, off Buttermere Moss and down over the waterfall of Moss Force into the valley between Knott Riggs and Robinson Craggs.
- 5.5.12 Once these three tributaries have converged they flow in a northerly direction towards the village of Stair and then onto Little Braithwaite. Newlands Beck then flows under the A66 and through Braithwaite Moss before reaching Bassenthwaite Lake. Downstream of Stair, Newlands Beck is highly modified, perched above the natural low point of the floodplain, and not in its original course. It has been dredged in the past and it has large embankments in places and wooden revetments to support the bankings which are now deteriorating. The habitat in this section of Newlands Beck is very homogeneous, with very little in-stream habitat and therefore poor for fry. Any fry found tend to be in the periphery where there is at least some tree roots or boards to hide in. This section of Newlands is also susceptible to drought due to not being in its natural course which was evident at the start of the 2018 season with little or no flow.
- 5.5.13 In the upper section of Newlands, which covers the three tributaries, Newlands Beck, Scope Beck and Keskadale Beck, trout fair better than salmon, which is to be expected in the upper catchment. Table 24 on page 63, shows that at most of these sites (site numbers 175 - 181), trout fry have increased in number or are maintaining a presence. Salmon fry aren't present on Keskadale Beck, however they have been recorded on Newlands Beck up by the climbing hut with numbers increasing over the years and a classification of excellent in 2019. Also the site at Chapel Bridge has recorded a few salmon fry in the last two years with a small increase in numbers in 2019. 2019 was also the first year salmon fry and parr were recorded on Scope Beck (site 178), low numbers but they did have a presence.
- 5.5.14 The middle section between Stair and Little Braithwaite (site numbers 169 - 174) despite having relatively poor habitat have elicited some salmon fry over the years with some sites increasing in number and some decreasing. Again, trout fry have slightly more numbers than salmon and appear to be maintaining a presence.
- 5.5.15 The lower section downstream of the A66 isn't really surveyed, as currently there is no purpose for surveys here and flows in this lower section tend to be high and fast due to the straightened nature of the watercourse.

Table 24: Fish per minute results for all the sites on Newlands Beck and tributaries across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
Watercourse	Site Number	Site Name										
Newlands Beck	169	Newlands Beck Bridge		0.0	0.0				0.0	0.2		
	170	Little Braithwaite	0.6	2.4				0.8	1.0			
	171	Lingholm Forestry	0.2		2.8	2.6	1.0	0.0		0.0	0.2	0.0
	172	Low Uzzicar	0.4			1.4	1.6	0.0			2.2	2.8
	173	Upper Uzzicar	1.6					0.0				
	174	Stair		0.4		3.6			1.4		1.8	
	175	Keskadale confluence	2.0					0.0				
Keskadale Beck	176	Gillbrow			4.2	5.4				0.0	0.0	
	177	Keskadale Farm		0.2		4.8	4.2		0.0		0.0	0.0
Scope Beck	178	Low House Farm			4.2		2.4			0.0		0.4
Upper Newlands Beck	179	Chapel Bridge	1.6			4.0	5.4		0.0		1.2	3.2
	180	Low Snab		0.2					0.0			
	181	Climbing Hut			2.6	6.8	3.2			3.0	3.8	8.8

Pow Beck

5.5.16 Pow Beck is a tributary of Newlands Beck but for most of its course actually runs parallel to Newlands Beck which is why here it is discussed separately. Pow Beck should actually be the true course of Newlands Beck as it is the low point of the floodplain. Pow Beck arises at the bottom of the slopes of Catbells, the tributaries flow into Swinside Moss and Pow Beck flows out of the moss. Pow Beck flows north, parallel to Newlands Beck until it reaches Little Braithwaite. Here Newlands Beck flows northwest and Pow Beck flows northeast, where it flows alongside the A66 towards Portinscale, and then goes under the road just before How Lane. It then flows under the old railway line and past How Farm before flowing through the farmland and marsh prior to Bassenthwaite Lake. As it flows through this section it is joined by many ditches which are acting as field drains. It then converges with Newlands Beck level with the village of Thornthwaite before flowing into the lake.

5.5.17 There are two sites (site numbers 182 & 183) regularly surveyed on Pow Beck, one near to Ullock Farm and the other near to where Pow Beck crosses under the railway line, another site has been proposed near to the A66 but trying to find who owns that bit of land is proving difficult. Salmon have never been recorded on Pow Beck, however, trout have been found at both sites. The lower site suffering from siltation and the railway embankments falling in, due to Storm Desmond, so fewer numbers are found here. The upper site near Ullock Farm has more trout fry due to better habitat. Table 25 shows the fry per minute values for the sites on Pow Beck across the five years. These sites weren't surveyed during the 2019 survey season as they were not a priority.

Chapel Beck

5.5.18 Chapel Beck is another tributary of Newlands Beck. It hasn't been surveyed for the last two years as it isn't high on the priority list. Table 25 also shows the fry per minute values for the site surveyed on Chapel Beck for the years it has been surveyed (site number 163). No salmon are found on Chapel Beck at this site as this is upstream of an aqueduct over the A66 which forms a barrier to fish passage. However, resident trout are found upstream of this structure and classifications for trout fry at this site have increased between the two years. Chapel Beck like many other watercourses in this area is heavily modified and straightened and has been dredged historically, leading to embanked river banks and very homogeneous habitat.

Table 25: Fish per minute results for all the sites on Pow Beck and Chapel Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
Watercourse	Site Number	Site Name										
Pow Beck	182	Railway embankment		0.0	0.6				0.0	0.0		
	183	Stepping Stones		0.6	1.8	5.0			0.0	0.0	0.0	
Chapel Beck	163	Chapel Beck Bridge		0.4	0.6				0.0	0.0		

5.6 Borrowdale - Upper Derwent Catchment

- 5.6.1 The headwaters of the River Derwent originate in the Borrowdale valley. Borrowdale is also one of the wettest places in the UK with average yearly rainfall of 3552 mm (139.9in), recorded at Seathwaite.
- 5.6.2 Within the Borrowdale Valley, 25 sites have been surveyed over the course of the five years. 18 of these sites were surveyed during the 2019 survey season and contributed 4.3% of the total trout fry recorded and 1.8% of the total salmon fry recorded. However, it was noted that lots of salmon parr were recorded in the Borrowdale sub-catchment during the 2019 survey season which can be seen in Appendix B on page 90 where the parr numbers are shown.
- 5.6.3 Figures 19 and 20 on pages 66 and 67 are maps of the Borrowdale valley which is the Upper Derwent sub catchment and show the location of the survey sites within the catchment and their corresponding site numbers. Because the catchment is so big it had to be split into two maps, Figure 17 shows the lower or downstream section of the catchment and Figure 18 shows the upper or upstream part of the catchment.

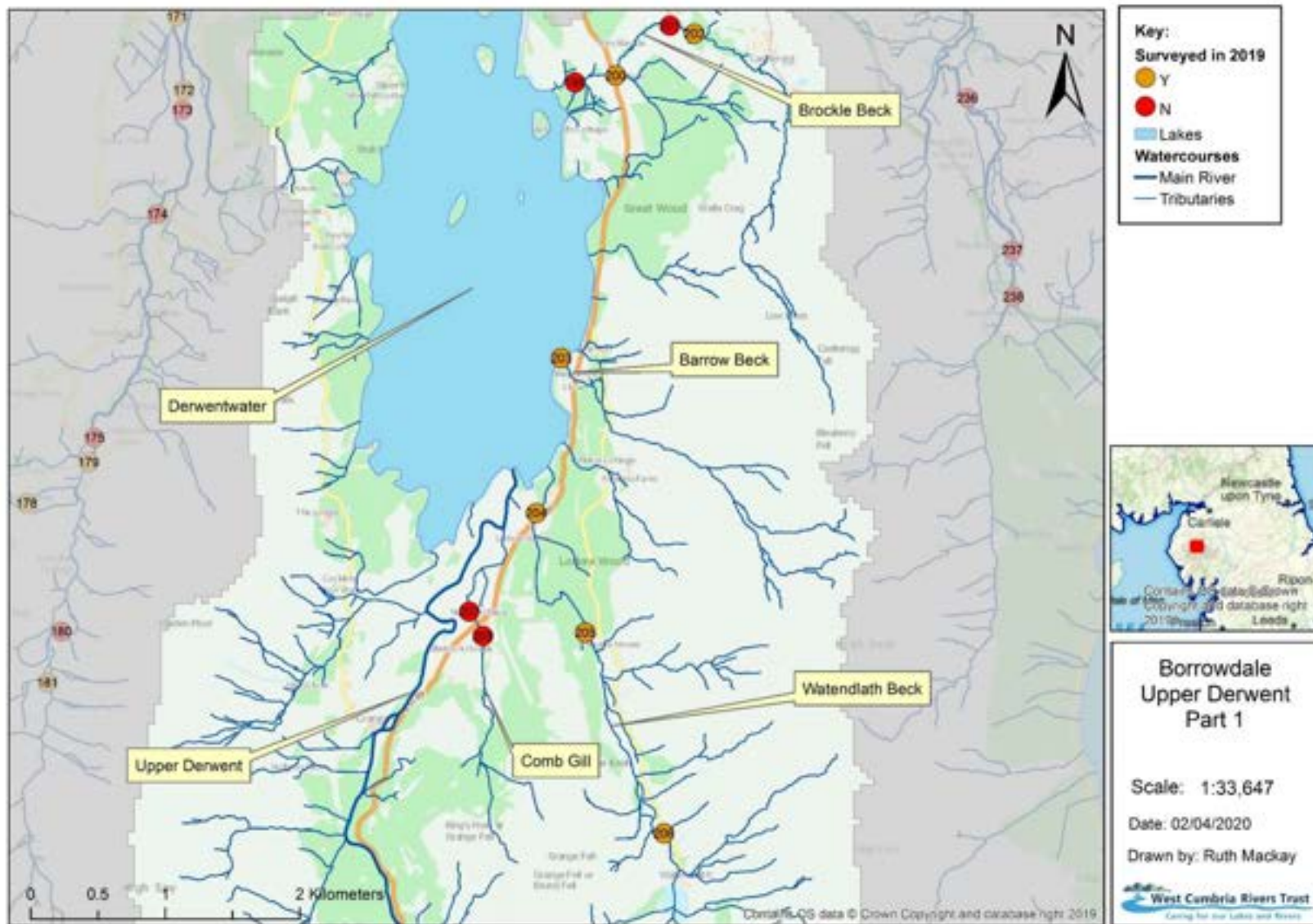


Figure 19: A map of the Upper Derwent and tributaries within the Borrowdale Valley, with the location of all the surveys sites and their site numbers. This sub-catchment is so large it has been split into two parts for the maps, this is Part 1 and is the downstream section of the valley.

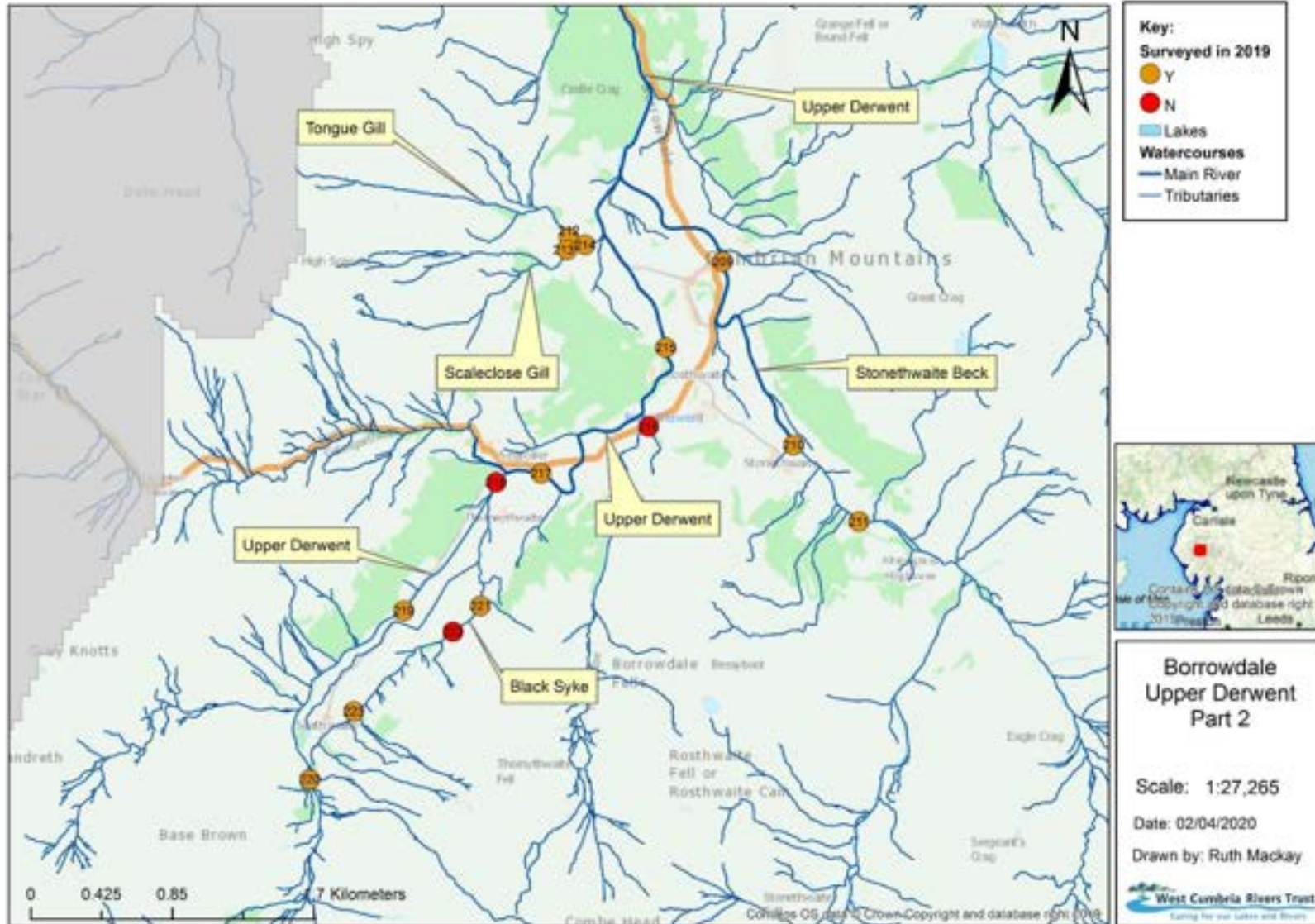


Figure 20: A map of the Upper Derwent and tributaries within the Borrowdale Valley, with the location of all the surveys sites and their site numbers. This sub-catchment is so large it has been split into two parts for the maps, this is Part 2 and is the upstream section of this valley.

Upper Derwent

- 5.6.4 For the survey the River Derwent upstream of Derwent Water is called the Upper Derwent and will be referred to as such within this report. This covers the area from the headwaters at Styhead Tarn to the lake shore where the Derwent flows into Derwent Water. The Upper Derwent originates in Styhead Tarn which sits in the valley between Great Gable and Seathwaite Fell. Styhead Gill flows out of the tarn in a north easterly direction towards Seathwaite Farm, and is joined by Grains Gill, once these two watercourses converge, the Upper Derwent is formed. Styhead Tarn is actually fed by another tarn; Sprinkling Tarn, which sits at the south side of Seathwaite Fell between Great Slack and Great End. Grains Gill originates on the East side of Seathwaite Fell, and flows between Seathwaite Fell and Glaramara. Once the Upper Derwent has formed it flows north east towards Rosthwaite, where it is joined by Combe Gill. The Upper Derwent then changes direction at Rosthwaite and flows north west and then north and is joined by Stonethwaite Beck, and Tongue Gill, amongst other smaller tributaries. It carries on in a northerly direction along the Borrowdale Valley towards the village of Grange and then towards Derwent Water, where it joins the lake near to Cat Gill Bay.
- 5.6.5 Five sites are regularly surveyed along the Upper Derwent, one upstream of Seathwaite, two between Seathwaite and Seatoller, one between Seatoller and Rosthwaite and one at Rosthwaite. More were planned to be surveyed downstream of Rosthwaite during the 2019 survey season, but were not able to be surveyed due to high river levels and time constraints.
- 5.6.6 Table 26 on page 69, shows the fry per number values and classifications for the five sites on the Upper Derwent across the five years. Salmon fry are found up here, but in low numbers and during the 2019 survey season, three of the sites recorded no salmon fry at all with classifications of absent. However, it is not all doom and gloom, as despite low or no salmon fry, salmon parr were recorded at most of these sites in 2019. Longthwaite recorded 6 salmon parr, Glaramara 8, and High House had 3. Trout fry numbers appear to be increasing at four of the five sites, with High house (site number 220) the only site showing a decrease.
- 5.6.7 The main river at the top two sites (219 and 220) is known for drying up because it's not in its natural course, having been moved historically to reclaim land for agricultural practises. This may have affected the results up here. However, it is also very difficult to survey the Upper Derwent up in Borrowdale because the water has a very low conductivity due to the water being so clean as its straight off the fells, and therefore it is difficult to put an electric current through the water to draw out the fish which may also affect the results.

Black Syke

- 5.6.8 Black Syke is a tributary of the Upper Derwent and is possibly, for at least part of its length, the original course of the Upper Derwent. Black Syke originates off Thornythwaite Fell as several smaller tributaries and then flows parallel to the Derwent towards Thornythwaite Farm.
- 5.6.9 Black Syke is particularly good for trout, especially trout parr with some pretty decent sized parr seen and also recorded. The largest recorded during the 2019 surveys was 165mm but an even bigger one was seen but evaded capture. As well as parr, trout fry are present and maintaining a presence at both sites on Black Syke. However, Black Syke is not as good for salmon as the habitat is more suited to trout, and no salmon fry were recorded at either site in 2019, but have been in the past, as seen in Table 26 on page 69; which shows the fry per minute values and classifications for Black Syke across the five years.

Table 26: Fish per minute results for all the sites on the Upper Derwent and Black Syke across the five years of surveys

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute					
A = Excellent	B = Good	C = Moderate											
D = Fair	E = Poor	F = Absent	Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
Upper Derwent	215	Longthwaite		0.6		4.0	4.4		0.8		3.4	1.4	
	217	Glaramara		0.0	0.8	0.4	1.8		0.2	0.0	0.0	0.0	
	218	Nichol Dub	0.0			1.2		0.0			1.0		
	219	Seathwaite Bridge	0.0	0.0	0.2	0.0	0.6	0.0	0.2	0.2	0.0	0.0	
	220	High House		0.2	0.2	0.0	0.0		0.0	0.2	0.4	0.0	
Black Syke	221	Thorneythwaite		2.8	4.2	0.4	2.4		0.0	0.0	0.2	0.0	
	222	Near Seathwaite bridge		2.6					0.2				
	223	Seathwaite Farm		1.6	1.0	2.0	0.8		0.2	0.0	0.0	0.0	

Combe Gill

- 5.6.10 Combe Gill is a small tributary of the Upper Derwent and originates on the Borrowdale Fells between Rosthwaite Fell and Thornythwaite Fell. It flows in a northerly direction off the fells, towards Burthwaite Bridge and under the B5289 to join the Upper Derwent before the village of Rosthwaite.
- 5.6.11 Only one site (site number 216) is conducted on Combe Gill and this is upstream of Burthwaite Bridge. Here the habitat is more suited to trout and is reflected in the number of trout fry recorded compared to the salmon fry as seen in Table 27 on page 70. As well as fry recorded at this site, a large number of parr have been recorded here with 13 trout parr and 1 salmon parr recorded in 2018 at this site. Unfortunately, this site was not surveyed in 2019 due to landowner objections and will be removed from the survey programme from now onwards.

Stonethwaite Beck

5.6.12 Stonethwaite Beck is a major tributary of the Upper Derwent and arises as Langstrath Beck out of Angle Tarn. Angle Tarn can be found on the north east side of Esk Pike and Langstrath Beck flows north east down the valley between Allen Craggs, Glaramara, Black Craggs, Rossett Pike and Buck Pike. Langstrath Beck continues to flow in a north easterly direction until it converges with Greenup Gill, where it then flows in a north westerly direction and becomes Stonethwaite Beck. Stonethwaite Beck then continues to flow towards the village of Rosthwaite where it goes past the back of pubs and hotels, before crossing under the B5289 to converge with the Upper Derwent at Stang Dub.

5.6.13 Only two sites are usually conducted on Stonethwaite Beck, one near the campsite at Stonethwaite Farm and the other in Rosthwaite behind the pub and hotels, with the addition of a third between these two sites in 2019. Table 27 shows the fry per minute values and classifications for the three sites (site numbers 209 - 211) on Stonethwaite Beck across the five years. Both salmon and trout fry are present to varying degrees and there are no obvious trends of increasing or decreasing. Site 209 has decreased whilst site 211 has increased. However, despite fry numbers being poor and varied, parr again are prevalent at these sites, in particular salmon parr with 8 salmon parr recorded at site 209, 10 at 210 and 3 at 211 during the 2019 survey season.

Table 27: Fish per minute results for all the sites on Combe Gill and Stonethwaite Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate										
D = Fair	E = Poor	F = Absent	Not surveyed									
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Combe Gill	216	Burthwaite Bridge			6.6	1.2				0.4	1.2	
Stonethwaite Beck	209	Rosthwaite Bridge				1.8	1.2				9.0	0.4
	210	Stonethwaite Bridge					0.2					0.4
	211	Camping Site		0.0		0.2	0.8		1.0		1.0	1.4

Tongue Gill

- 5.6.14 Tongue Gill is another tributary of the Upper Derwent. It arises off the fells, High Spy and High Scawdel. Once it reaches the floodplain or valley bottom, it is joined by Scalecrose Gill, before flowing in an easterly direction to converge with the Upper Derwent. The section that flows along the valley bottom to meet the Upper Derwent isn't in its original course and therefore is known to dry up, it is also historically dredged and in need of some dappled shade, through tree planting.
- 5.6.15 Three sites are surveyed on Tongue Gill. One on Tongue Gill upstream of the confluence with Scalecrose Gill, one on Scalecrose Gill upstream of the confluence and one downstream of the confluence before Tongue Gill reaches the Upper Derwent. Despite once being a good and well known spawning tributary for salmon, no salmon have been recorded on Tongue Gill since 2016 and even then the numbers were low. However, during the 2019 survey season salmon were found at all three sites and two of them had classifications of moderate. Which is an encouraging sign.
- 5.6.16 Trout on the other hand fair slightly better on Tongue Gill. Table 28 shows the fry per minute values and the classifications for both salmon and trout, however, in relation to trout fry the table shows that the numbers of trout fry recorded has varied over the years, with some good years and some poorer but are maintaining a presence.

Table 28: Fish per minute results for all the sites on Tongue Gill across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
		Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Tongue Gill	212	Right	0.6	2.0	3.2	7.2	1.6	0.0	1.0	0.0	0.0	2.0
	213	Left	1.0	1.8	3.8	0.6	0.4	0.0	1.0	0.0	0.0	1.4
	214	New Bridge	0.0	1.4	2.0	1.4	1.4	0.0	0.0	0.0	0.0	0.4

Comb Beck/ Gill

5.6.17 Another Comb Gill or Comb Beck, this time arising off Grange Fell and flowing down Troutdale towards Green Bank House and the Borrowdale Hotel before joining with the Upper Derwent just before it reaches the lake. This beck has not been surveyed in the last two years for various reasons, but trout fry are maintaining a presence and salmon fry are also maintaining a presence with an increase in numbers at the upper site from none to a classification of good. Table 29 shows the fry per minute values and the classifications for Comb Beck.

Watendlath Beck

5.6.18 Watendlath Beck flows directly into Derwent Water. It arises up on the Watendlath Fells, off the north side of Low Saddle as Blea Tarn Gill and flows into Watendlath Tarn, before leaving the tarn as Watendlath Beck, and flowing down the hanging valley towards Lodore Woods and over the Lodore Falls. It then goes past the Lodore Falls Hotel, under the B5289 and into the lake. Watendlath Beck is also fed by a small tributary that flows off High Saddle and Ullscarf into Blea Tarn and then out of Blea Tarn and into the headwaters of Watendlath Beck. Watendlath Tarn itself is a popular fishing destination as it is stocked with wild brown trout and locally reared rainbow trout.

5.6.19 Three sites were surveyed on Watendlath Beck in 2019. No salmon fry were found at the sites upstream of the waterfall, and this year none at the site downstream of the falls. However, in the past some salmon fry have been recorded at the site downstream of the falls as seen in Table 29. Trout on the other hand are recorded upstream and downstream of the falls, but not in large numbers and are maintaining a presence.

Table 29: Fish per minute results for all the sites on Comb Beck and Watendlath Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
D = Fair	E = Poor	F = Absent										
Watercourse	Site Number	Site Name										
Comb Beck	207	D/S Borrowdale hotel	0.4	0.8	0.6			0.0	0.6	0.4		
	208	U/S Borrowdale hotel	1.0	0.2	0.6			0.0	0.0	3.4		
Watendlath	204	Ladore Bridge		0.2	0.0	0.2	0.2		0.0	0.6	0.0	0.0
	205	Thwaite House				1.6	0.6				0.0	0.0
	206	Watendlath Farm		0.0		0.4	0.2		0.0		0.0	0.0

Brockle Beck

5.6.20 Brockle Beck is another tributary that flows directly into Derwent Water. It arises off Bleaberry Fell and flows in a northerly direction over Low Moss and Castlerigg Fell, towards Castlerigg Hall Farm. Then it flows in a north westerly direction towards Springs Road, before turning south west to flow under the B5289, through Ings Wood and into the lake at Strandshag Bay.

5.6.21 Usually no salmon fry are found on Brockle Beck which is why on Table 30 most the sites have classifications of absent across the years; but salmon parr having been recorded here in the past, but this isn't shown in the table as the values just represent fry. However, during the 2019 survey season, salmon fry were recorded on Brockle Beck for the first time, but not in large numbers. Trout fry are present at all sites bar site number 199. They appear to be maintaining a presence but neither increasing or decreasing to large degrees. Table 37 shows the results for the fry per minute values for both trout and salmon fry across the five years.

Barrow Beck

5.6.22 Barrow Beck is a tributary that flows directly into Derwent Water at Barrow Bay. It arises as Ashness Gill off Bleaberry Fell and High Seat as a series of small watercourses, which converge to form the beck and then flows over a few waterfalls, under the famous Ashness Bridge and the B5289 road before entering the lake.

5.6.23 Barrow Beck is a new addition to the survey programme in 2019 and the only site conducted on it was below the B5289 road as the topography above the road is quite steep and unsuitable for fish. Some trout fry were recorded here but not many, leading to a classification of poor. No salmon fry were recorded here leading to a classification of absent as seen in Table 30. However, despite no salmon fry being recorded, a dead salmon parr was found at the site, meaning salmon may be present on this watercourse just not in the survey area.

Table 30: Fish per minute results for all the sites on Brockle and Barrow Becks across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute					
A = Excellent	B = Good	C = Moderate											
D = Fair	E = Poor	F = Absent	Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
Brockle Beck	199	Ings Wood		0.0	0.0				0.0	0.0			
	200	Bowe Barn	0.4			0.0	1.2	0.0			0.0	0.2	
	201	Springs Farm		0.2	0.6	3.2			0.0	0.0	0.0		
	202	Springs Wood			0.6	1.8	0.2			0.0	0.0	0.0	
Barrow Beck	203	Barrow Bay					0.2					0.0	

5.7 River Greta Catchment

- 5.7.1 The River Greta is a main tributary of the River Derwent and the Greta/Glenderamackin sub-catchment forms a vital catchment for salmon, hence why many of the becks are included in the programme. The Greta catchment includes many tributaries such as St John's Beck, Naddle Beck, Glenderaterra, Glenderamackin, Mosedale Beck and Trout Beck.
- 5.7.2 A total of 47 sites were surveyed within the Greta sub-catchment across the five years. Of the 47, 31 sites were surveyed during the 2019 survey season and the contributed 6.9% of the total trout fry recorded and 15.1% of the total salmon fry recorded.
- 5.7.3 Figures 21 and 22 on pages 75 and 76 are maps of the River Greta catchment and show the location of the survey sites within the catchment and their corresponding site numbers. Because the catchment is so big it had to be split into two maps, Figure 21 shows the lower or downstream part of the catchment and Figure 22 shows the upper or upstream part of the catchment.

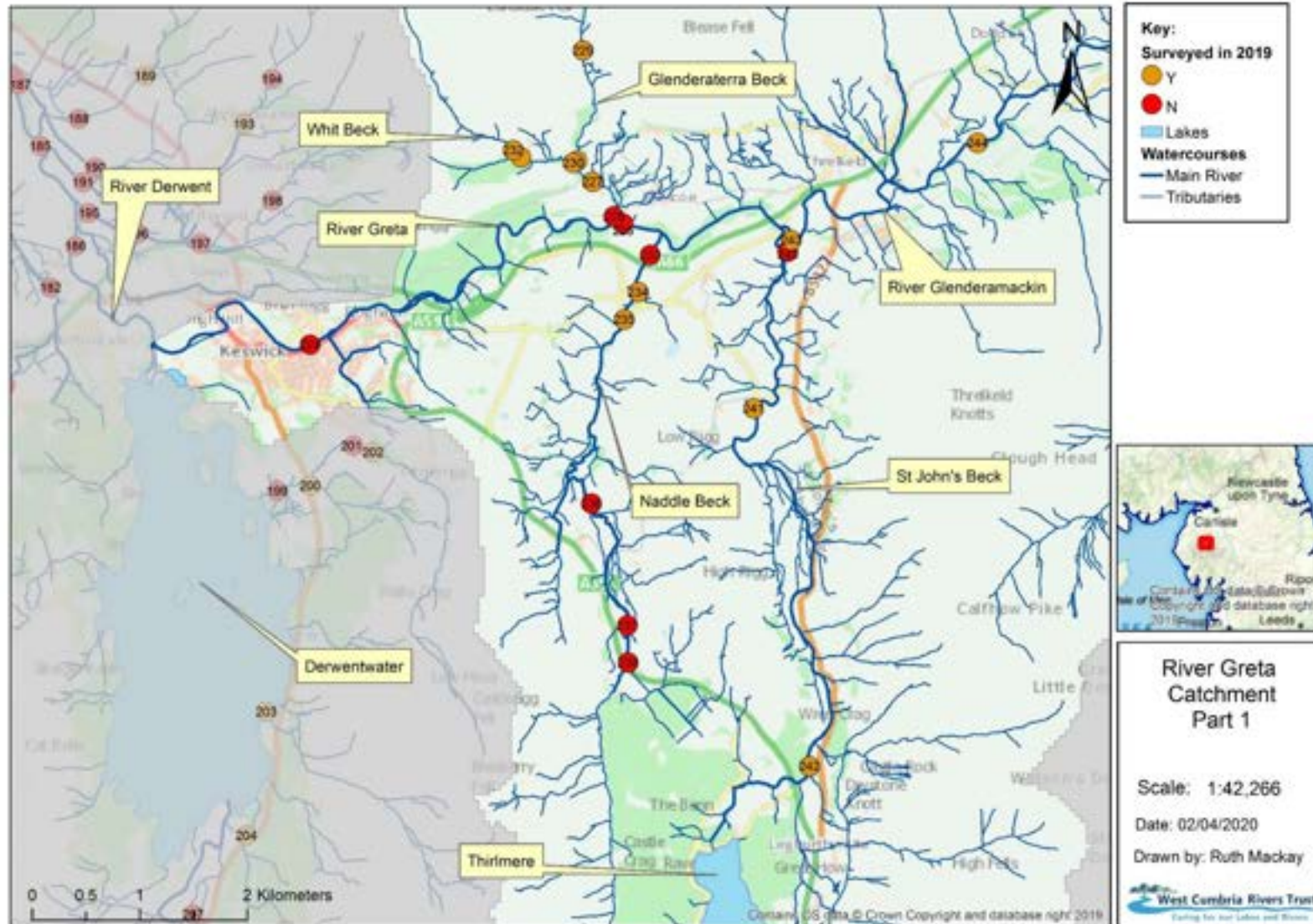


Figure 21: A map of the River Greta catchment, with the location of all the surveys sites and their site numbers. This sub-catchment is so large it has been split into two parts for the maps, this is Part 1 and is the downstream section of the catchment.

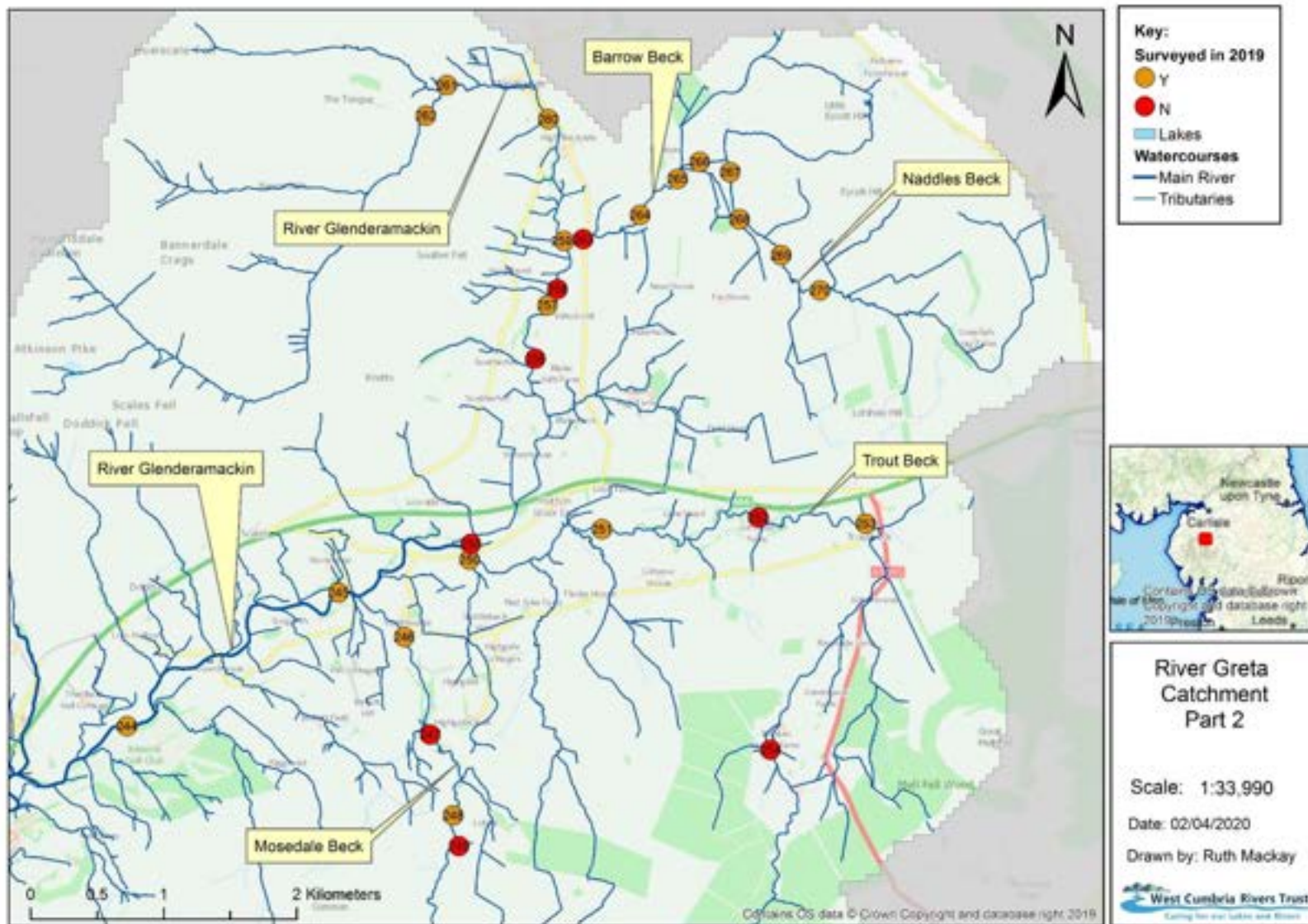


Figure 22: A map of the River Greta catchment, with the location of all the surveys sites and their site numbers. This sub-catchment is so large it has been split into two parts for the maps, this is Part 2 and is the upstream section of the catchment.

Main River

- 5.7.4 The River Greta forms when St John's Beck and the Glenderamackin merge at Threlkeld Bridge. It flows in a westerly direction under the A66, towards Keswick, it then follows the road until it crosses back underneath it and enters town. It meanders its way through town and then converges with the River Derwent near to Portinscale.
- 5.7.5 Surveys were undertaken at two sites on the main river Greta in 2018, but were not repeated in 2019 as river levels rose before the opportunity to survey them arose. The two sites surveyed in 2018 were one in the town, in Upper Fitz Park, along Penrith Road; the other was conducted upstream of the confluence of the Glenderaterra and the Greta, but downstream of the confluence of the Naddle with the Greta. Table 31 shows the fry per minute results and the classifications for these two sites in 2018. Both were scored poor for trout fry, but numbers of salmon fry were good resulting in excellent classifications. Both sites also recorded a reasonable amount of salmon parr which is not shown in Table 31.

Table 31: Fish per minute results for all the sites on the River Greta across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate										
D = Fair	E = Poor	F = Absent										
		Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
River Greta	224	Upper Fitz Park				0.2					8.4	
	225	Wescoc Wood				0.2					8.0	

Glenderaterra Beck

- 5.7.6 The Glenderaterra is a tributary of the Greta, it arises off Lonscale Fell and Mungrisdale Common, near to the popular Skiddaw House Hostel. It flows in a southerly direction between Lonscale Fell and Blease Fell, before being joined by Whit Beck and a few other smaller tributaries and flowing into the Greta near Brundholme.
- 5.7.7 Seven sites have been surveyed on the Glenderaterra and Whit Beck across the five years, of which six were surveyed during the 2019 survey season. Trout fry were recorded at all sites bar the one above the culvert on Whit Beck. As shown in Table 32, trout fry are present on the Glenderaterra and in good numbers. 2016 was the worst year as this was post Storm Desmond, then numbers appear to have increased over the years with a small decrease in 2019 which may be down to poor catch rates because of higher than normal flows.
- 5.7.8 Site numbers 231 and 232 are above and below a culvert that has a large drop and is a barrier to fish passage. No trout or salmon fry were found above the culvert, but one lone trout parr was. Trout fry have been recorded just downstream of the culvert in the past but in 2019 only four trout parr were recorded here, hence the fry classification of absent.
- 5.7.9 The Glenderaterra, throughout the five years of surveying, has never been very good for salmon fry, because of mobile substrates and regular flood events which affect spawning success by washing the redds out. However, in 2018, the sites had good numbers of salmon fry meaning some adult fish made it up stream and had some spawning success. However, in 2019, numbers have dropped again to absent at most sites or low numbers, which can be seen in Table 32.

Table 32: Fish per minute results for all the sites on Glenderaterra and Whit Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent												
B = Good												
C = Moderate												
D = Fair												
E = Poor												
F = Absent												
Not surveyed												
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Glenderaterra	226	Brundholme		0.8		0.4			0.0		6.8	
	227	Ford		0.2	3.8	6.0	3.6		0.0	1.0	5.6	0.2
	228	Glenderaterra Derwent Folds				3.2	1.6				3.2	0.0
	229	Blencathra		0.0	4.6	5.0	2.2		0.2	0.0	2.2	0.0
Whit Beck	230	Whit Beck Derwent Folds		3.0			4.8		0.0			0.0
	231	Lonscale Farm		0.0	1.6		0.0		0.0	0.0		0.0
	232	Lonscale Farm above culvert					0.0					0.0

Naddle Beck

- 5.7.10 Naddle Beck arises of the east side of High Seat and Bleaberry Fell as Shoulthwaite Gill. It then flows north between the Bleaberry Fell on the left and Castle Crag and The Benn on the right, Thirlmere behind these. Once it goes under the A591 it becomes Naddle Beck, flowing in a northerly direction parallel to the road in the valley bottom. It is joined by other smaller tributaries such as Williams Beck, before it is culverted under the A66 to join the Greta at Wescoe, just upstream of the confluence of the Glenderaterra and the Greta.
- 5.7.11 Six sites have been surveyed on Naddle Beck over the five years, of these only two were surveyed during the 2019 survey season due to access issues because of the United Utilities West Cumbria Supply Project. Table 33 shows the fry per minute results and classifications for both trout and salmon fry across the five years.
- 5.7.12 Both salmon and trout are present on Naddle Beck, but salmon are present to a greater extent. Over the five years, salmon have either increased in number or maintained a presence. Whereas trout are maintaining a presence at most sites, with neither major increases or decreases, but total numbers recorded are much lower compared to the salmon. Despite no trout fry being recorded at Naddle Bridge in 2019, as shown in Table 33; 6 trout parr were recorded at this site, so trout are still present here.

Table 33: Fish per minute results for all the sites on Naddle Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent	B = Good	C = Moderate										
D = Fair	E = Poor	F = Absent										
		Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Naddle Beck	233	Below A66	0.4	0.0				2.8	2.0			
	234	u/s of A66, d/s of minor road	0.6	0.6		0.0	0.8	7.0	7.2		12.4	14.4
	235	Naddle Bridge	0.4	0.8		0.2	0.0	3.0	6.8		5.2	1.2
	236	Dalebottom		6.0		2.8			1.2		1.0	
	237	d/s Rough How Bridge	1.0					1.4				
	238	Rough How Bridge	0.4	1.2		2.0		0.6	0.0		4.2	

St John's Beck

- 5.7.13** St John's Beck originates out of Thirlmere Reservoir, and flows north along the valley of St John's in the Vale, it converges with the Glenderamackin at Threlkeld Bridge to form the River Greta. St John's Beck is one of the best spawning tributaries in the catchment for salmon after the main river. Three sites are surveyed on St John's Beck every year, but Table 34 on page 81, which shows the fry per minute values and classifications across the five years, has four sites. This is because a different site was surveyed in 2015, but it was decided in 2016 to drop this site and have another further upstream. Trout tend to fair less well on St John's Beck because they are out-competed by the salmon, however in 2019, numbers increased on the previous year, but are still not as high as 2017, which has the best numbers of trout fry for the three sites across the five years.
- 5.7.14** Salmon fry numbers on St John's Beck are much higher than trout and regularly receive good or excellent classifications. However, in 2019, numbers of salmon fry dropped compared to the previous year, particularly at sites 239 and 241. This is partly down to the fact St John's Beck was surveyed later on in the survey season compared to previous years. Usually it is surveyed in August but in 2019 August was very wet and river levels were very high, so it was surveyed in September instead once it was suitable to do so. Even though best efforts are done to try and survey the sites at roughly the same time each year, sometimes it just isn't possible. Normally over the course of a season the number of fry at any one site would decrease. Lots of fry emerge from the eggs, but not all these have a chance of survival as they compete for food, space, hidey holes and get predated on. If you were to survey the same site in July and then in September, you would expect the numbers recorded to decrease due to this mortality rate. It is thought that part of the reason for the large decrease between 2018 and 2019 on St John's Beck is this, but also due to the high flows in August many fry will have been moved on downstream resulting in fewer numbers when the surveys were conducted in September. However, despite this, the number of salmon fry recorded on St John's Beck in 2019 is still more than many of the other sites within the catchment.
- 5.7.15** One of the factors positively affecting fish, particularly salmon numbers, on St John's Beck is the compensatory flow out of Thirlmere Reservoir, which has to be maintained at a certain level by the water company at all times, which is beneficial to the fish in times of drought and flood. Despite good in-river habitat of pools and riffles, gravels for spawning and places for the fry to hide such as weed and roots, some habitat improvements are needed such as bankside fencing and tree planting to provide dappled shade, plus the channel has been modified in places, which means it could be even better than it is.

Table 34: Fish per minute results for all the sites on St John's Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute					
A = Excellent	B = Good	C = Moderate											
D = Fair	E = Poor	F = Absent	Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
St John's Beck	239	Threlkeld Bridge	1.2	0.2	3.8	0.4	1.2	3.4	2.2	7.0	17.6	6.2	
	240	u/s Smolt Trap	1.2					1.8					
	241	Wanthwaite Bridge	0.8	0.4	2.2	0.2	1.2	5.4	5.2	9.4	67.6	2.6	
	242	UU Car Park		0.2	4.0	0.8	1.2		1.2	20.6	29.2	11.0	

Mosedale Beck

5.7.16 Mosedale Beck arises on Matterdale Common off the north side of Greta Dodd and Little Dodd. It flows in a north east direction between Clough Head and Randerside over Matterdale Common, before flowing down onto Threlkeld Common, and flowing in a northerly direction towards Wallthwaite Farm. At Dobson’s Bridge Mosedale Beck and the Glenderamackin converge.

5.7.17 Four sites are usually surveyed on Mosedale Beck and Table 35 shows the fry per minute values and classifications for these sites across the five years. In 2019, only two of these sites were surveyed for various reasons. Trout fry are maintaining a presence on Mosedale Beck and some sites they have increased in number. Only site 248 is showing a decrease but despite no fry being recorded in 2019 at this site, several large trout were recorded and seen. Over the year’s salmon have not maintained a presence on Mosedale Beck but in the last two years some salmon fry have been recorded at the lowest site on the watercourse with a classification of good in 2018 and moderate in 2019. It is encouraging to see them returning to the bottom of this watercourse.

Table 35: Fish per minute results for all the sites on Mosedale Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent												
B = Good												
C = Moderate												
D = Fair												
E = Poor												
F = Absent												
Not surveyed												
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Mosedale Beck	246	Walthwaite Farm		0.0		1.0	1.0		0.0		5.6	2.2
	247	Highgate Close		0.0	1.2				0.0	0.0		
	248	Lobbs Lower		0.0	0.2	0.4	0.0		0.0	0.0	0.0	0.0
	249	Lobbs Upper		0.0	0.4	2.8			0.0	0.0	0.0	

River Glenderamackin

- 5.7.18 The River Glenderamackin arises up on Mungrisdale Common and is joined by Scales Beck which flows out of Scales Tarn which sits in the glaciated cirque between Sharp Edge and the summit of Blencathra. The Glenderamackin then flows south east between Scales Fell and Bannerdale Craggs, over a waterfall before flowing north east along the bottom of Souther Fell. It is joined by Bannerdale Beck and Bullfell Beck before flowing through the village of Mungrisdale and in a southerly direction towards the A66. It crosses under the road at Hutton Moor End and then flows south west along the valley bottom parallel to the road. It is joined by Trout Beck at Wolt Bridge and Mosedale Beck at Dobson's Bridge. It keeps flowing south west past the village of Threlkeld until it converges with St John's Beck at Threlkeld Bridge to form the River Greta.
- 5.7.19 Eleven sites have been surveyed on the River Glenderamackin over the five years. Eight sites in total are surveyed regularly and were conducted on the Glenderamackin in the 2019 survey season. Table 36 on page 84, shows the fry per minute values and the classifications for these sites across the five years for both trout and salmon fry. Trout fry are maintaining a presence with neither major increases or decreases, but numbers tend to be greater higher up the watercourse which you would expect. Salmon fry in 2019 were present at all the eight sites surveyed. In previous years no salmon fry had been recorded on Mungrisdale Common (sites 261 and 262) due to a barrier to fish passage. This barrier has now deteriorated/ been partially removed, so that in the correct conditions fish can navigate their way over it. The conditions must have been suitable in the autumn/ winter of 2018 to allow one or more pairs of salmon to spawn on Mungrisdale Common for salmon fry to be recorded during these surveys there in 2019, which is encouraging to see. The largest numbers of salmon fry recorded are at the sites towards the lower parts of this watercourse as would be expected. Generally, there is a decrease in salmon fry numbers recorded between 2018 and 2019 at most sites but classifications are still good or moderate.

Table 36: Fish per minute results for all the sites on the River Glenderamackin across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent												
B = Good												
C = Moderate												
D = Fair												
E = Poor												
F = Absent												
Not surveyed												
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
River Glenderamackin	243	Threlkeld Bridge Gln	0.4			0.6	0.2	3.8			40.8	7.2
	244	Threlkeld Hall				0.6	0.6				32.6	3.0
	245	Dobson's Bridge		0.4	0.4	0.8	0.2		0.4	1.4	17.2	4.4
	255	Wolt Bridge	1.4	0.4				4.2	0.8			
	256	Blake Hills Farm		0.0	0.2				0.4	2.4		
	257	Wilton Hill	1.6			3.0	1.0	2.4			3.2	1.6
	258	u/s of Wilton Hill	1.8					2.0				
	259	u/s of Barrow Beck	0.8	0.0	2.0	4.6	1.2	1.8	0.2	0.4	7.2	2.6
	260	High Beckside				3.8	1.4				8.6	1.6
	261	Mungrisdale Common 1			2.6	5.4	2.8			0.0	0.0	3.2
	262	Mungrisdale Common 2				0.8	1.2				0.0	0.6

Barrow Beck

- 5.7.20 Barrow Beck is a tributary of the Glenderamackin, it arises on Eycott Hill as several smaller tributaries including Naddles Beck, which all converge at the base of the hill near to the farm of Redmire to form Barrow Beck. Barrow Beck then flows in the westerly direction to join the Glenderamackin downstream of the village of Mungrisdale.
- 5.7.21 Barrow Beck is on the survey programme because some work has been undertaken to improve the habitat here and also some further projects are in the pipeline, and therefore the surveys are acting as monitoring for the improvement projects. Lots of work has been conducted by Cumbria Wildlife Trust on Eycott Hill itself which will increase and improve the habitat and water quality of the watercourses, particularly Naddles Beck that flows off it.
- 5.7.22 Trout fry at the eight sites has fluctuated over the years between absence and presence, and when present to varying degrees. There are no obvious trends of increase or decrease in the numbers of trout fry which can be seen in Table 37, which shows the fry per minute values and the classifications for these sites across the five years. Salmon fry on the other hand have not been present on Naddles and Barrow Beck apart from the bottom two sites across the five years. However, in 2019, some salmon fry was recorded on Eycott Hill, which shows the improvement works are having an impact and also conditions in autumn and winter were suitable to allow a pair of adult salmon to get up here to spawn. It is great to see them returning to this area.

Table 37: Fish per minute results for all the sites on Barrow and Naddles Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute				
A = Excellent												
B = Good												
C = Moderate												
D = Fair												
E = Poor												
F = Absent												
Not surveyed												
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
Barrow Beck	263	below road	0.2	0.0				1.4	0.0			
	264	Bridge			0.4	0.0	0.4			0.2	0.2	0.8
	265	Track	0.0		0.6	0.0	0.0	0.0		0.0	0.0	0.0
Naddles Beck	266	By Tree	0.4		0.0	0.4	0.0	0.0		0.0	0.0	0.0
	267	Eycott Hill 1	0.8		1.2	0.6	0.8	0.0		0.0	0.0	0.2
	268	Eycott Hill 2	1.0				0.0	0.0				0.4
	269	Eycott Hill 3	0.8				0.2	0.0				0.4
	270	Eycott Hill 4	0.2				0.8	0.0				0.0

Trout Beck

5.7.23 Trout Beck is the most eastern watercourse in the catchment and is the last watercourse to be discussed in this report. It arises up in Matterdale Common as Groove Beck, flows in a northerly direction over Cockley Moor, towards Rookin House Farm and onto the village of Troutbeck. It then flows west, parallel to the A66 before joining the Glenderamackin at Wolt Bridge.

5.7.24 Five sites have been surveyed on Trout Beck across the five years and three of these sites were surveyed during the 2019 survey season. The fry per minute values and the classifications for all five sites across the years can be seen in Table 38. Numbers of trout fry on Trout Beck have increased up to 2018 and then a small decrease between 2018 and 2019, with classifications of poor and fair in 2019 at the lower two sites and absent at the uppermost site. Salmon are also found here, but not in great numbers and again numbers increasing up to 2018 and then a small decrease in 2019 with classifications of poor and fair as well at the bottom two sites and absent at the uppermost.

Table 38: Fish per minute results for all the sites on Trout Beck across the five years of surveys.

Key: Classifications & Grade			Trout fry/ minute					Salmon fry/ minute					
A = Excellent	B = Good	C = Moderate											
D = Fair	E = Poor	F = Absent	Not surveyed										
Watercourse	Site Number	Site Name	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	
Trout Beck	250	Wolt Bridge	0.0	0.0		1.2	0.4	1.2	0.4		1.6	0.8	
	251	Lisco Farm				3.4	0.8				1.6	0.2	
	252	Gill Head Farm		0.2		4.2			0.0		0.2		
	253	Mell Fell View		0.0			0.0		0.0			0.0	
	254	Rookin House		0.0					0.0				

6 Conclusion

- 6.1.1 In conclusion, 2019 was largely a successful survey season, despite a dry July and a very wet August. A total of 161 sites across the Derwent catchment were surveyed, producing 2,640 trout of which 2,138 were trout fry and 502 trout parr and 2,475 salmon were recorded of which 2,155 were salmon fry and 320 salmon parr. This was an increase on the previous year for the number of trout fry recorded but a decrease for salmon fry. Once again, the results also highlighted that the main river sites still appear to be the key areas for Atlantic salmon, in line with the designation of the main Derwent as an SAC for Atlantic salmon (and other features).
- 6.1.2 Also, due to suitable conditions in the autumn/ winter of 2018 and habitat improvement work having taken place, a lot of salmon fry were recorded in places they have not been before or for a while, such as Eycott Hill, Mungrisdale Common and Tongue Gill. This shows that whilst conditions were suitable allowing adult salmon to reach these areas, that habitat improvement works in those areas is having a positive impact on water quality, spawning opportunity and providing suitable fry habitat to allow fry to be present in these areas.
- 6.1.3 This is the fifth year of surveying juvenile salmonids in the River Derwent catchment so whilst the results cannot yet be used to detect long-term trends, a database is being compiled using the results, and minor comparisons between the years have been made.
- 6.1.4 As well as the fish database, we are continuously building and adding to the habitat database. The habitat data for 2019 has not been reported on within this report as it is fairly similar to previous years but the data was used when talking about the fish results in section five as habitat quality and fish numbers go hand in hand as sites with greater fish densities reflect the sections of river with good habitat. However, the database is used to inform WCRT and partners where habitat work would provide the greatest benefit for fish populations.
- 6.1.5 The data and reports from this project has been used by ourselves and partner organisations to submit grant applications to the Water Environment Grant Fund for several large scale projects for catchment scale restoration in the Derwent catchment which were successful and work is now underway on these projects. Several smaller funding bids have also been submitted to various other funders for habitat improvement works within the River Derwent catchment which have been identified as a result of the survey results. It shows how important this work is to help provide evidence for funding bids.
- 6.1.6 The data will also be used to monitor projects that have or will be delivered on the ground to determine their success in improving the habitat and water quality and thus increasing fish numbers. Gathering data in these areas is vital to prove that these techniques work, although the impact of the works may take a few years to effect fish numbers, depending on the techniques used. However, it is important that to effectively monitor habitat improvements, that projects or work undertaken within the catchment are recorded, and this can be done through the Catchment Partnership Portal available on the WCRT's website.
- 6.1.7 Having established this yearly juvenile survey programme, which has demonstrated that lack of fry within the catchment is not an issue, especially in the main rivers, attention is now turning to other gaps in the research, data and knowledge of other stages of the salmonid life cycle, particularly smolts and their survival rate. WCRT along with partners and other interested parties, are working on an exciting new project which aims to trap and tag salmon smolts within the Derwent catchment as they head out to sea for the first time and monitor where they go and where, unfortunately, they are lost.

7 Acknowledgements

7.1.1 There are many organisations and individuals who have contributed to make this project, not only work, but to become a success. Without all those mentioned below, this project would not be possible and WCRT is extremely grateful to all those who helped in a variety of ways including;

- Approximately 100 landowners and tenants who gave permission to access the river from their land, encouraged us to do so and showed great interest in the results.
- Financial contributions from the Rivers Corridor Group, the Derwent Owners Association, Cockermouth Anglers Association, Keswick Anglers Association, Bowland Game Fishing Association, National Trust, Cumbria Wildlife Trust, Lancaster University, Lord and Lady Egremont and the Water Environment Grant funding scheme which is funded through the European Agricultural Fund for Rural Development.
- The 30 dedicated volunteers who helped undertake the surveys throughout the summer and clocked up over 600 hours of in kind time towards the project.

7.1.2 If you would like to see the continuation of this project and agree that the data collected is highly valuable, then please consider funding this project for many more years to come.

8 References

Crozier, W.W & Kennedy, G.J.A. (1993) "Application of semi-quantitative electrofishing to juvenile salmonid stock surveys." *Journal of Fish Biology* (1994), **45**, 159-164.

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*.

Spey Foundation (2018). "Electrofishing Survey of the River Spey, Summer 2018 Report." Available at: https://www.speyfisheryboard.com/wp-content/uploads/2019/02/Spey_2018_electrofishing_survey.pdf

Wyatt, R.J. & Lacey, R.F. (1994) "Guidance notes on the design and analysis of river fishery surveys." R&D Note 292. *National Rivers Authority, Bristol*.

Wyatt, R.J. & Lacey, R.F. (1999) "Semi-Quantitative Methods for Fisheries Classification." Technical Report W167. *Environment Agency, Bristol*.

9 Appendix A

An example survey sheet used to record the fish and habitat data.

WCRT Electrofishing 5 Minute Survey



Date		
Surveyors	Fisher	Catcher
Start Time		
Site Name		
Catchment		
Tributary		
WCRT site ID		
Survey reason		
Access & Location Description:		
Grid refs (start)		
Grid refs (finish)		
Altitude		
Photo refs		

Banks:	LB	RB
Reinforced/modified		
Tree roots		
Earth Cliff		
Undercut		
Major erosion		
Overhanging veg		
% shade		
Fenced?		
Riparian width (if fenced)		
Bank vegetation		
H. balsam/JK. INNS		
Stock access		
Stock type		
Visible damage		

Land Use: (outside bankside fencing!)		
Permanent pasture		
Improved grassland		
Tilled land/arable		
Coniferous woodland		
Broadleaf woodland		
Tall herb/scrub		
Wetland		
Other		

Weather conditions:

Water level	L / M / H
Recent floods	Y / N
Cloud cover (%)	
Weather	

In river:

Width(m)	Length(m)
Av depth	Ankle /Calf /Knee
Water clarity	Optimal / sub-opt
Conductivity (µS/cm)	
Temperature (°C)	
pH	
Bedrock (%)	
Boulders (%)	
Cobbles (%)	
Gravel (%)	
Sand (%)	
Silt/Mud (%)	
Pools (%)	
Riffle (%)	
Macrophytes	Abs / Pres / Lots
Ranunculus	Abs / Pres / Lots
Algae	Abs / Pres / Lots
LWD	Abs / Pres / Lots
Barrier details	

Equipment settings

Voltage (v)	
Frequency (Hz)	
Pulse width (%)	

Other fish

Eel	
Lamprey	
Bullhead	
Stoneloach	
Minnow	
Stickleback	
Crayfish	

No. of missed fry	
--------------------------	--

Notes:	
--------	--

mm	Trout	Salmon
<20		
25		
30		
35		
40		
45		
50		
55		
60		
65		
70		
75		
80		
85		
90		
95		
100		
105		
110		
115		
120		
125		
130		
135		
140		
145		
150		
155		
160		
165		
170		
175		
180		
185		
190		
195		
200		
200 mm +		

10 Appendix B

This table is a copy of the fish data collected during the 2019 survey season and is in date order from the start of the season to the end.

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
04/07/2019	River Cocker	NY 15397 23742	2	0	112	8	6	0	0	12	3	0	0
04/07/2019	River Cocker	NY 15193 22514	5	0	50	21	12	0	0	7	1	0	0
04/07/2019	River Cocker	NY 14765 21892	3	1	3	7	1	0	0	5	0	0	0
04/07/2019	River Cocker	NY 15130 21092	0	0	16	9	2	0	0	0	19	0	0
04/07/2019	Liza Beck	NY 15310 22421	23	0	54	14	0	0	0	0	0	0	0
05/07/2019	River Cocker	NY 12938 28435	2	0	58	0	1	0	0	15	0	0	0
05/07/2019	River Cocker	NY 13668 27127	5	0	54	0	4	0	0	20	4	0	0
05/07/2019	River Cocker	NY 14950 26490	3	1	54	4	1	0	0	9	0	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
05/07/2019	Sandy Beck	NY 13688 26987	12	0	9	0	0	0	0	11	0	0	0
05/07/2019	Sandy Beck	NY 13010 26551	59	0	6	0	0	0	0	12	0	0	0
08/07/2019	River Derwent	NY 03586 30106	0	0	14	2	12	0	0	9	0	0	0
08/07/2019	River Derwent	NY 05565 30155	0	0	24	0	10	0	0	23	0	0	0
08/07/2019	River Derwent	NY 07582 30976	0	0	11	0	14	0	0	35	0	0	0
08/07/2019	River Derwent	NY 08573 31149	0	0	11	0	20	0	0	93	1	0	0
09/07/2019	River Derwent	NY 10711 30883	1	0	17	0	9	0	0	33	0	0	0
09/07/2019	River Derwent	NY 12219 30961	0	0	88	0	11	0	0	3	0	0	0
09/07/2019	River Cocker	NY 11721 29617	8	0	7	0	6	0	0	25	4	0	0
10/07/2019	River Derwent	NY 12460 31779	0	1	141	1	30	0	0	10	0	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
10/07/2019	River Derwent	NY 15462 33538	0	0	98	0	28	0	0	16	0	0	0
10/07/2019	River Derwent	NY 17201 32986	0	0	114	0	22	0	0	16	0	0	0
10/07/2019	River Derwent	NY 18968 33171	0	0	42	0	15	0	0	4	0	0	0
10/07/2019	River Derwent	NY 18092 32903	0	0	43	0	33	0	0	19	0	0	0
12/07/2019	River Derwent	NY 04358 30762	0	0	79	0	23	0	0	67	0	0	0
12/07/2019	River Derwent	NY 12809 32476	0	0	66	0	30	0	0	11	0	0	0
12/07/2019	River Derwent	NY 13943 33221	0	0	74	0	12	0	0	8	1	0	0
12/07/2019	River Cocker	NY 14477 26978	6	0	68	3	18	0	0	19	1	0	0
16/07/2019	Whit Beck	NY 15144 24990	13	0	43	1	0	0	0	3	1	17	0
16/07/2019	Whit Beck	NY 15398 24642	27	2	14	0	0	0	0	1	0	9	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
16/07/2019	Whit Beck	NY 15519 24742	5	2	64	5	2	0	0	6	0	1	0
16/07/2019	Whit Beck	NY 16232 25527	11	10	20	12	6	0	0	0	0	0	0
17/07/2019	Meregill Beck	NY 15147 24307	29	0	0	0	2	1	0	0	0	0	0
17/07/2019	Meregill Beck	NY 15106 24548	22	1	0	1	5	0	0	0	3	5	0
17/07/2019	Hope Beck	NY 16562 23944	25	9	0	1	0	0	0	0	0	0	0
17/07/2019	Hope Beck	NY 16920 23801	4	22	0	0	0	0	0	0	0	0	0
17/07/2019	River Cocker	NY 15201 24811	0	1	95	8	12	0	0	2	0	0	0
18/07/2019	Park Beck	NY 14394 20541	11	1	17	3	0	0	0	1	0	0	0
18/07/2019	Park Beck	NY 13987 20803	25	1	41	5	0	0	0	1	0	0	0
18/07/2019	Mosedale Beck	NY 13813 20352	20	14	0	0	0	0	0	0	0	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
18/07/2019	Mosedale Beck	NY 13744 19864	0	4	0	0	0	0	0	0	0	0	0
22/07/2019	Dub Beck	NY 13413 21085	2	0	0	0	9	0	0	0	17	0	0
22/07/2019	Crab Tree Beck	NY 13044 21503	0	0	0	0	2	0	0	0	0	0	0
22/07/2019	Holme Beck	NY 13414 21070	0	1	0	0	3	0	0	0	0	0	0
22/07/2019	Dub Beck	NY 11775 22383	0	2	0	0	0	0	0	6	75	0	0
22/07/2019	Dub Beck	NY 11426 22775	2	0	0	0	1	0	0	0	0	0	0
23/07/2019	Park Beck	NY 13663 20875	4	0	39	2	1	0	0	0	0	0	0
23/07/2019	Highnook Beck	NY 13455 20919	8	1	47	8	1	0	0	0	0	0	0
23/07/2019	Rannerdale Beck	NY 16376 18929	89	4	0	0	0	0	0	0	0	0	0
23/07/2019	Rannerdale Beck	NY 16707 18755	81	12	0	0	0	0	0	0	0	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
24/07/2019	Mill Beck - Buttermere	NY 17027 17098	49	2	0	0	3	0	0	0	1	0	0
24/07/2019	Gatesgarth Beck	NY 19204 15039	27	0	0	0	2	0	0	0	0	0	0
24/07/2019	Gatesgarth Beck	NY 19934 14922	24	0	0	0	1	0	0	0	0	0	0
24/07/2019	Gatesgarth Beck	NY 20978 14845	62	3	0	2	0	0	0	0	0	0	0
25/07/2019	Bitter Beck	NY 12768 30610	11	11	0	0	4	0	0	26	0	1	0
25/07/2019	Bitter Beck	NY 13427 31134	27	6	0	0	0	0	0	0	0	0	0
25/07/2019	Bitter Beck	NY 14167 31163	47	4	0	0	0	0	0	0	0	1	0
26/07/2019	Tom Rudd Beck	NY 13126 30039	7	8	0	0	3	0	0	7	5	2	0
26/07/2019	Tom Rudd Beck	NY 13873 29912	13	6	0	0	7	0	0	26	20	2	0
26/07/2019	Tom Rudd Beck	NY 15001 30083	13	1	0	0	0	0	0	3	0	8	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
26/07/2019	Tom Rudd Beck	NY 15928 29832	18	1	0	0	0	0	0	23	3	2	0
29/07/2019	Liza Beck	NY 15972 21233	0	0	0	0	0	0	0	0	0	0	0
29/07/2019	Thackthwaite Beck	NY 14987 23721	4	1	0	0	1 possibly	0	0	0	0	0	0
29/07/2019	Ashlands	NY 15747 23339	27	1	0	0	0	0	0	0	0	0	0
29/07/2019	Thackthwaite Beck	NY 14604 23579	0	0	0	0	0	0	0	0	0	0	0
30/07/2019	Little Sandy Beck	NY 12939 28115	4	0	2	2	2	0	0	37	33	25	0
30/07/2019	Little Sandy Beck	NY 12686 27674	0	0	2	0	0	0	0	14	22	0	0
30/07/2019	Sandy Beck	NY 12158 26407	86	9	2	1	2	0	0	0	0	0	0
30/07/2019	Sandy Beck	NY 11777 26058	92	1	0	0	1	0	0	0	2	0	0
31/07/2019	River Marron	NY 07408 23917	25	0	1	1	6	0	0	0	0	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
31/07/2019	Wood Beck	NY 07645 21026	27	5	0	0	1	0	0	0	0	0	0
31/07/2019	Rakegill Beck	NY 08283 20467	64	2	0	0	2	0	0	0	0	0	0
31/07/2019	Wisenholme Beck	NY 08465 20569	52	8	0	0	0	0	0	0	0	0	0
31/07/2019	Black Beck	NY 07728 23988	40	2	0	0	1	0	0	0	0	14	0
01/08/2019	River Marron	NY 06528 20705	48	11	0	1	6	0	0	0	0	4	0
01/08/2019	Wood Beck	NY 06679 20883	72	14	0	6	0	0	0	0	0	0	0
01/08/2019	Snary Beck	NY 08298 22682	42	4	0	0	2	0	0	0	0	0	0
02/08/2019	River Marron	NY 06804 21800	50	6	2	1	2	0	0	0	0	0	0
02/08/2019	Broughton Beck	NY 08778 31253	2	0	5	1	6	0	0	114	0	0	0
02/08/2019	Broughton Beck	NY 09542 32374	0	1	1	1	6	0	0	110	83	2	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
05/08/2019	Lostrigg Beck	NY 04946 23701	24	1	0	0	0	0	0	14	225	0	0
05/08/2019	Lostrigg Beck	NY 04815 24980	16	2	0	0	0	0	0	74	74	0	0
05/08/2019	Lostrigg Beck	NY 04557 25975	5	2	0	0	0	0	0	18	28	0	0
05/08/2019	Lostrigg Beck	NY 04563 27249	0	0	0	0	2	0	0	44	58	1	0
07/08/2019	Wythop Beck	NY 17998 29405	36	15	0	0	2	0	0	0	0	0	0
07/08/2019	Wythop Beck	NY 18523 29276	23	11	0	0	0	0	0	0	0	0	0
08/08/2019	Dubwath Beck	NY 18265 30572	20	6	0	0	3	0	0	18	51	0	0
08/08/2019	Wythop Beck	NY 17772 29961	28	6	0	0	4	0	0	2	1	0	0
13/08/2019	Warnscale Beck	NY 18957 14772	10	0	0	0	1	0	0	0	3	0	0
13/08/2019	Paddle Beck	NY 12723 28211	1	0	0	0	0	0	0	37	0	100	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
19/08/2019	Chapel Beck	NY 22110 31093	22	0	0	0	0	0	0	1	0	0	0
19/08/2019	Dash Beck	NY 22274 31688	21	4	0	2	0	0	0	0	0	0	0
19/08/2019	Chapel Beck	NY 11897 28466	18	0	0	0	1	0	0	0	0	0	0
19/08/2019	Pooley Beck	NY 22019 30962	0	0	0	0	9	1	0	0	0	0	0
20/08/2019	Scalegill Beck	NY 19723 35483	20	1	0	0	1	0	0	2	0	0	0
21/08/2019	Blaze Beck	NY 18158 25152	13	15	0	0	0	0	0	0	0	0	0
21/08/2019	Mill Beck	NY 25547 26086	3	19	0	0	0	0	0	0	0	0	0
21/08/2019	Applethwaite Ghyll	NY 26468 25638	3	12	0	0	0	0	0	0	0	0	0
23/08/2019	Broughton Beck	NY 09189 32552	0	0	0	0	1	0	0	96	79	41	0
23/08/2019	Brides Beck	NY 09619 32747	5	1	2	1	5	0	0	18	25	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
23/08/2019	Brides Beck	NY 10728 33491	4	0	0	0	0	0	0	16	1	1	0
27/08/2019	Blumer Beck	NY 17667 34915	29	10	1	1	0	0	0	3	17	0	0
27/08/2019	Blumer Beck	NY 19032 35502	4	7	0	2	0	0	0	14	0	0	0
27/08/2019	Dash Beck	NY 21674 30997	13	2	0	2	1	0	0	0	8	0	0
27/08/2019	Chapel Beck	NY 22986 31813	27	1	6	0	0	0	0	0	0	0	0
28/08/2019	Coledale Beck	NY 20243 21736	7	16	0	0	0	0	0	0	0	0	0
28/08/2019	Coledale Beck	NY 19979 21555	0	0	0	0	0	0	0	0	0	0	0
28/08/2019	Coledale Beck	NY 23621 23474	18	7	0	1	0	0	0	5	0	0	0
28/08/2019	Newlands Beck	NY 23817 22716	5	3	0	0	3	0	0	3	8	0	0
28/08/2019	Newlands Beck	NY 23867 22167	8	2	14	1	1	0	0	3	0	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
29/08/2019	Newlands Beck	NY 23159 19400	27	13	16	3	0	0	0	0	0	0	0
29/08/2019	Keskadale Beck	NY 20997 18913	21	8	0	0	0	0	0	0	0	0	0
29/08/2019	Newlands Beck	NY 22855 17761	16	6	44	1	0	0	0	0	0	0	0
29/08/2019	Scope Beck	NY 22700 19096	12	14	2	0	0	0	0	0	0	0	0
04/09/2019	Tongue Gill	NY 24984 15049	8	5	10	0	0	0	0	0	0	0	0
04/09/2019	Scalecrose Gill	NY 24974 14975	2	0	7	0	0	0	0	0	6	0	0
05/09/2019	Brockle Beck	NY 27664 22587	1	4	0	0	0	0	0	0	0	0	0
05/09/2019	Brockle Beck	NY 27080 22276	6	3	1	1	0	0	0	5	39	0	0
05/09/2019	Watendlath Beck	NY 26854 18133	3	4	0	0	0	0	0	0	1	0	0
05/09/2019	Watendlath Beck	NY 27439 16639	1	2	0	0	0	0	0	0	17	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
05/09/2019	Tongue Gill	NY 25082 15005	7	5	2	0	0	0	0	4	7	0	0
09/09/2019	River Glenderamackin	NY 33288 25465	3	0	15	5	0	0	1	14	27	0	0
09/09/2019	River Glenderamackin	NY 34878 26469	1	0	22	0	1	0	0	3	0	0	0
09/09/2019	River Glenderamackin	NY 36454 30026	7	0	8	3	0	0	0	2	0	0	0
09/09/2019	River Glenderamackin	NY 35693 30281	14	1	16	0	0	0	0	0	0	0	0
09/09/2019	River Glenderamackin	NY 35534 30052	6	6	3	0	0	0	0	0	0	0	0
10/09/2019	Glenderaterra Beck	NY 29708 25101	18	6	1	11	0	0	0	0	0	0	0
10/09/2019	Whit Beck	NY 29042 25329	0	4	0	0	0	0	0	0	0	0	0
10/09/2019	Whit Beck	NY 28970 25395	0	1	0	0	0	0	0	0	0	0	0
10/09/2019	Glenderaterra Beck	NY 29619 26322	11	4	0	5	0	0	0	0	0	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
11/09/2019	Whit Beck	NY 29528 25278	24	2	0	2	0	0	0	0	0	0	0
11/09/2019	Glenderaterra Beck	NY 29564 25294	8	2	0	7	0	0	0	0	0	0	0
11/09/2019	St John's Beck	NY 31725 19665	6	2	55	14	0	0	0	3	0	0	0
13/09/2019	River Glenderamackin	NY 36575 29111	6	1	13	1	0	0	0	3	0	0	0
13/09/2019	Barrow Beck	NY 37145 29305	2	1	4	5	0	0	0	20	88	11	0
13/09/2019	Barrow Beck	NY 37426 29576	0	1	0	1	0	0	0	12	53	53	0
13/09/2019	Naddles Beck	NY 37592 29705	0	0	0	0	0	0	0	12	16	5	0
13/09/2019	Naddles Beck	NY 37822 29627	4	2	1	1	0	0	0	15	15	12	0
19/09/2019	Naddle Beck	NY 30133 24076	4	11	72	14	2	0	0	1	0	0	0
19/09/2019	Naddle Beck	NY 30002 23821	0	6	6	7	0	0	0	15	56	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
19/09/2019	River Glenderamackin	NY 31555 24559	1	0	36	13	0	0	0	3	0	0	0
19/09/2019	St John's Beck	NY 31523 24453	6	6	31	8	2	0	0	8	4	13	0
19/09/2019	St John's Beck	NY 31206 22994	6	7	13	14	0	0	0	3	21	5	0
20/09/2019	Trout Beck	NY 36859 26945	4	4	1	3	0	0	0	13	0	0	0
20/09/2019	River Glenderamackin	NY 36449 28627	5	1	8	5	0	0	0	18	0	0	0
20/09/2019	Naddles Beck	NY 37893 29272	0	0	2	0	0	0	0	18	3	5	0
20/09/2019	Naddles Beck	NY 38205 29003	1	2	2	4	0	0	0	26	71	1	0
20/09/2019	Naddles Beck	NY 38497 28739	4	0	0	0	0	0	0	16	19	1	0
23/09/2019	Upper Derwent	NY 25566 14389	22	1	7	6	3	0	0	3	0	0	0
23/09/2019	Upper Derwent	NY 24819 13634	9	3	0	8	2	0	0	0	0	0	0

Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
23/09/2019	Upper Derwent	NY 23994 12811	3	0	0	0	1	0	0	0	3	0	0
23/09/2019	Upper Derwent	NY 23429 11797	0	2	0	3	0	0	0	0	0	0	0
23/09/2019	Black Syke	NY 24455 12839	12	15	0	0	1	0	0	0	17	0	0
23/09/2019	Black Syke	NY 23694 12206	4	1	0	0	1	0	0	0	0	0	0
25/09/2019	Barrow Beck	NY 26675 20173	1	2	0	1	0	0	0	2	45	0	0
25/09/2019	Watendlath Beck	NY 26488 19021	1	0	0	0	0	0	0	7	0	0	0
25/09/2019	Stonethwaite Beck	NY 25909 14904	6	0	2	8	0	0	0	6	1	0	0
25/09/2019	Stonethwaite Beck	NY 26726 13345	4	0	7	3	0	0	0	1	0	0	0
25/09/2019	Stonethwaite Beck	NY 26334 13805	1	0	2	10	0	0	0	4	1	0	0



Date	Watercourse	Grid Reference	Trout Fry	Trout Parr	Salmon Fry	Salmon Parr	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
26/09/2019	Mosedale Beck	NY 35372 26135	5	0	11	10	0	0	0	12	0	0	0
26/09/2019	Mosedale Beck	NY 35740 24796	0	2	0	0	0	0	0	0	0	0	0
26/09/2019	Trout Beck	NY 35862 26718	2	0	4	2	0	0	0	15	23	0	0
26/09/2019	Trout Beck	NY 38841 26987	0	2	0	0	0	0	16	30	38	0	0