





River Derwent Fish and
Habitat Surveys Project

Fish and Habitat
Survey Report 2018



Project	Report No.	Revision No.	Date of Issue
River Derwent Fish and Habitat Surveys Project	004	003	14 th June 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.

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1 Executive Summary

- 1.1.1 The River Derwent fish and habitat survey project started in 2015 and is now in its fourth 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. 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. Each survey site is then assigned a grade of A to F, according to the numbers of fry, with A being the highest quality sites with the most fry. Grading is in line with the National Fisheries Classification Scheme (NFCS). The habitat data is put into a scoring matrix and then assigned a classification of either; Maintain, Repair or Restore.
- 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,
 - The data from the 2018 survey season hasn't been calibrated for the reasons stated within the report.
- 1.1.5 During the 2018 survey season, WCRT conducted surveys at a total of 157 sites, this being the most sites in a survey season to date. In total 6,863 salmonids were recorded, of which 2606 were trout and 4257 were salmon. These numbers can be broken down further into fry and parr numbers; 2022 were trout fry and 4025 were salmon fry (fry being less than a year old); and 584

were trout parr and 232 were salmon parr (parr being young fish over a year old). 81% of sites had trout fry present, 54% of sites had salmon fry present. Only three sites had no fish present at all, including minor species. When the total number of fry recorded was compared to the previous year (2017) there was a 564% increase in the number of salmon fry recorded, and a 7% increase in the number of trout fry recorded.

- 1.1.6 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. 49% of the salmon fry recorded were caught at the 27 main river sites, this is half the salmon fry recorded at just 17% of the total number of sites surveyed. The main reason for the large increase in the number of salmon fry recorded between previous years and the 2018 survey season is down to these 27 main river sites. Normally the main river sites can't be surveyed due to high and fast flows, which would lead to poor catch efficiency and for the safety of the survey team. However due to the low river levels at the start of the season, the opportunity arose to survey these sites. The high number of salmon fry in the main rivers 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. It is also possible that a high proportion of salmon fry were recorded at the main river sites because as water levels dropped and receded during the drought, the survival instinct kicked in and the fish swam downstream, out of the tributaries and into the main rivers, to where there was more water present. Overall, there were 17 category A sites for salmon, 12 category B sites and 17 category C sites for salmon. Despite the fact half the salmon fry recorded were found at the main river sites, there was also an increase in the number of salmon fry recorded in the tributaries compared to previous years.
- 1.1.7 The habitat data collected also helps to understand the fish results, generally it was noted that sites with greater fish densities reflect the sections of river with good habitat, but it 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.
- 1.1.8 Overall, 2018 was a very successful survey season, especially for salmon fry, but this largely reflects the opportunity to survey more main river sites. Trout appear to be making more 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. 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 2018 surveys were funded by a Patagonia Environmental Grant of the Tides Foundation, and other financial contributions from: The Rivers Corridor Group, the Derwent Owners Association, Cockermouth Anglers and Bowland Game Fishing. 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 type 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 interested parties. WCRT had 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.
- 2.1.5 The River Derwent Fish and Habitat Survey Project in 2018 was funded by a Patagonia Environmental Grant of the Tides Foundation, and other financial contributions from: The Rivers Corridor Group, the Derwent Owners Association, Cockermouth Anglers and Bowland Game Fishing.

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.
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.
- 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 is a catch per unit of effort (time) rather than 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),

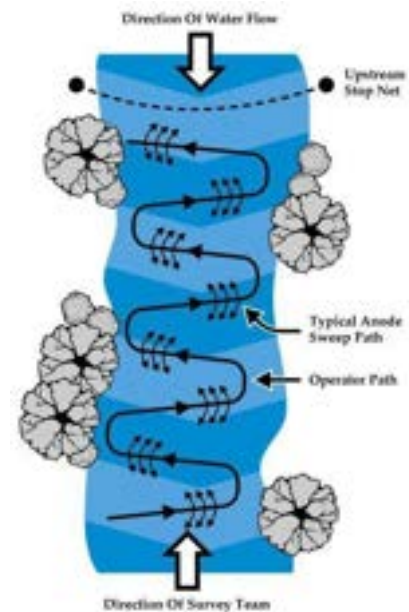


Figure 1: A diagram to show the survey method of the quantitative method but is also similar to semi quantitative in terms of the zig zag pattern and the direction of travel. (Diagram from E Fish 500W kit manual, 2012).

- 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.
- 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. In 2016 the EA undertook 27 survey sites in the Derwent catchment, which is more than the minimum requirements for their monitoring programme, but this was to determine the effects of Storm Desmond, which hit during spawning season. 2017 was the year they would normally survey the Derwent catchment on the rotational programme and they surveyed a total of 35 sites within the Derwent catchment. This year, 2018, the EA only surveyed 4 sites within the Derwent catchment, which is the minimum requirement for a year where the Derwent catchment isn't priority, and therefore WCRT attempted to survey the other 31 sites as part of our proposed survey sites for 2018.

3.4 Survey Locations

- 3.4.1 2018 marks the fourth consecutive year of surveying, with a total of 240 sites having been surveyed in this time. A total of 25 sites have been surveyed for four consecutive years, 55 have been surveyed three times within the four years and 79 have been surveyed twice within the four years. 81 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 157 sites were surveyed in the 2018 season and the location of these can be seen in Figure 2, on page 12.

3.5 Survey Timings

- 3.5.1 Surveys were 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 in 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 This year due to drought at the start of the survey season, the focus was to survey the main river sites or sites where the channel is slightly wider and deeper, first, to make the most of the opportunity to get to these areas where flows would otherwise be too deep or too fast to allow accurate sampling.
- 3.5.4 However due to the drought some survey sites on smaller tributaries were dry or reduced to a trickle. Surveying at these sites wasn't undertaken during the drought and an effort was made to try and survey all tributaries post drought once the river levels had risen again.
- 3.5.5 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.

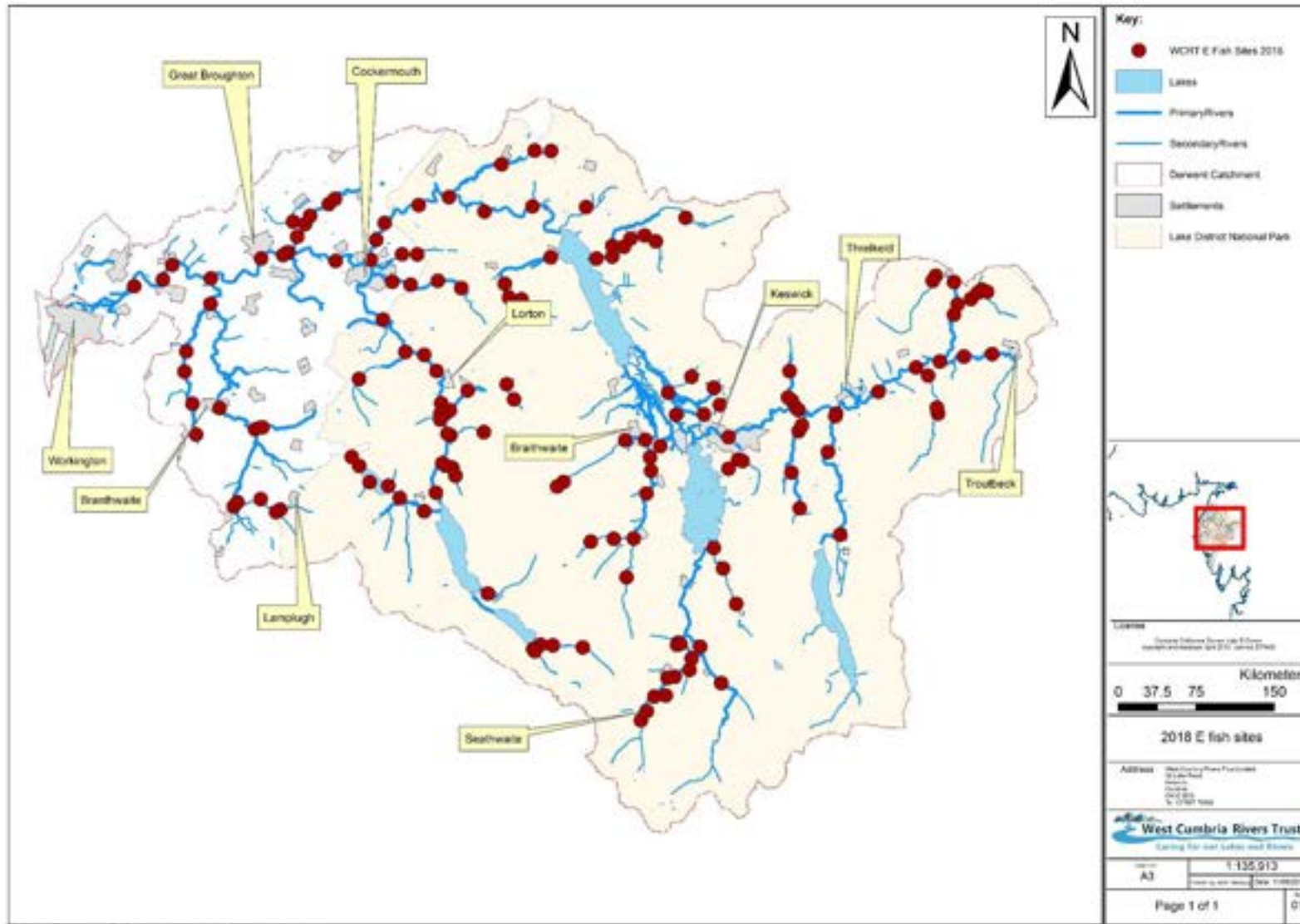


Figure 2: A map showing the location of the 2018 survey sites within the Derwent catchment.

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 97.
- 3.6.2 Data analysis consists of statistically assigning the recorded fish data a grade according to the EA's NFCS scheme, so that the data can be compared year on year, and also with data from across the country and collected using different survey methods. 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, as seen in Figure 3, below.

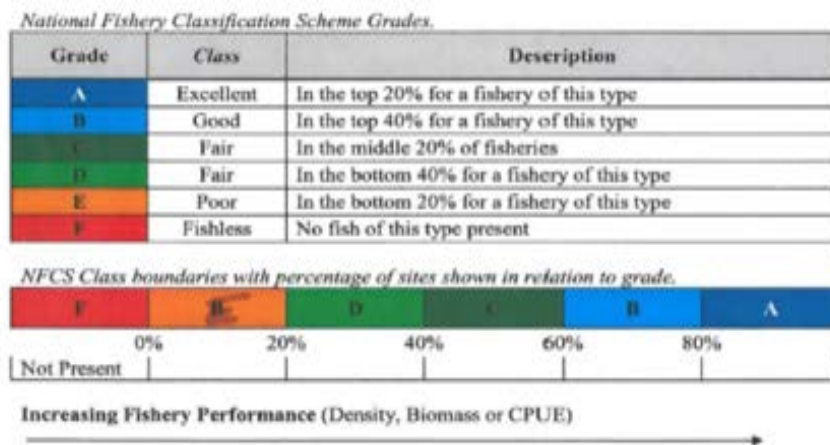


Figure 3: NFCS grades

- 3.6.3 Before the sites can be assigned a NFCS grade, 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 4, is a histogram which represents salmon at all the sites surveyed in the Marron sub catchment, the x axis is the length of fish in mm and the y axis is 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 4 the natural break is 90mm between fry and parr for salmon in the Marron sub catchment.

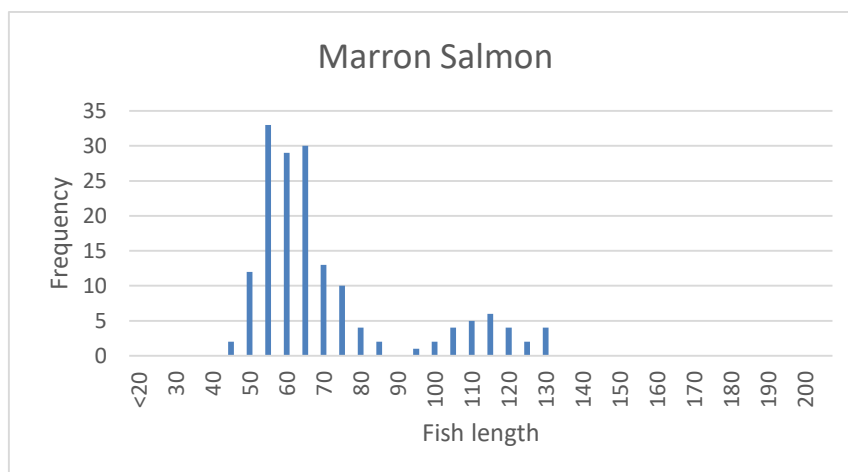


Figure 4: An example histogram used to determine the cut off value between fry and parr for salmon on the Marron sub catchment.

3.6.4 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 5 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 5-minute survey to get a calibrated result per 100m². The correlation equation produced in 2016 can be seen below in Table 1.

	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

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.

3.6.5 Once fish densities per 100m² have been calculated, each site can then be assigned a grade according to the NFCS, using the values in Table 2. 0+ being fry and >0+ being parr. As this survey focuses on fry, just the fry are assigned a grade. Parr numbers are recorded in Appendix B on page 98.

Species Group	Class					
	A →	← B →	← C →	← D →	← E	F
Level One						
0+ Brown/ Sea Trout	38	17	8	3		0
>0+ Brown Trout	21	12	5	2		0
0+ Salmon	86	45	23	9		0
>0+ Salmon	19	10	5	3		0
>0+ Rainbow Trout	2	0.5	0.25	0.1		0

Table 2: Classification boundaries for NFCS as provided by the Environment Agency. Values represent salmonid abundance per 100m².

- 3.6.6 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.
- 3.6.7 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 either 2017 or 2018 due to lack of Environment Agency resources therefore the equations in Table 1 were used to calibrate the 2017 data on the premise discussed in 3.6.6. For the purposes of analysing trends in this report, the 2015 data was also calibrated retrospectively using the equations in Table 1, as at the start of the project in 2015 WCRT hadn't adopted the method of using the NFCS and therefore didn't need to calibrate. However, after reading more about calibrations it was decided that the equations in Table 1 weren't suitable for this year's data as conditions were different due to drought and therefore 2018's data hasn't been calibrated. Going forward WCRT will aim to conduct their own yearly calibrations on a select number of sites.
- 3.6.8 The data in this report from 2018, therefore has been extrapolated to 100m² and assigned a grade according to the NFCS but please bear in mind it hasn't been calibrated and may not be an accurate representation of fish densities, but will at least give a general idea to the health of the catchment and general spatial and temporal trends.

3.7 Habitat Data Analysis Methods

- 3.7.1 The habitat data collected at each site is scored using a weighted scoring system, with higher scores meaning better habitat for fish. For example, the highest scoring sites had complex habitats, including: trees adjacent to the watercourse, dappled shade, no stock access, gravel provision with minimal silt, no barriers, no invasive species, and large wooded debris provision.
- 3.7.2 Following on from last year's comments the scoring system has been tweaked slightly to make sure the score is a more realistic representation and takes into account the fact that bigger and wider rivers, the in-river habitat and substrate are more important, and the smaller and narrower rivers, the marginal and bank habitats are more important. The amendments made meant the level of importance for various habitat characteristics changed slightly based on the average width measurements taken when surveying.
- 3.7.3 Depending on the scores, the sites were then assigned a category, either Restore, Repair and Maintain, each defined as requiring the following levels of work to provide the best habitat for fish:
- **Maintain** - limited small scale work required such as insertion of large woody debris (for example, Figure 5).
 - **Repair** - modest work such as fencing off buffer strips, provision of new gravels, willow spiling, invasive species control and tree planting (for example, Figure 6).

- **Restore** - major restoration works such as re-routing the channel (for example, Figure 7).

3.7.4 As well as each site being assigned to the categories above; the average score for each tributary is calculated and then the tributary is also assigned to one of the categories, Maintain, Repair or Restore. Some of the final tributary classifications are then adjusted based on local knowledge, known works in the area, or proposed works in the area, as the averages don't fully represent the complete watercourse as the scores are based on just the sections seen during surveying.



Figure 5: Two photographs showing sites which were classed as *Maintain*, the left has dappled shade, good substrate provision, but is just in need of some woody debris, the right having had tree planting and buffer strips installed, but needs maintaining to allow benefits to occur.



Figure 6: Two photographs of sites which were classed as *Repair*, the left needing invasive species control, the right in need of riparian fencing and a buffer strip to prevent livestock damaging the banks and entering the watercourse.



Figure 7: Two photographs showing sites classed as *Restore*, the left is a section that is known to dry up completely during drought because it's not in its natural course, the right is a very straight and altered watercourse that suffers from acidification.

4 Overall Results and Discussion

4.1 Summary

4.1.1 On the whole 2018 was WCRT's most successful survey season to date with 157 sites surveyed - 21 sites more than any previous year. 27 of the total 157 sites were main river sites, (Rivers Greta, Marron, Cocker and the Derwent downstream of Keswick).

4.1.2 Table 3 summarises the 2018 survey sites and fish numbers compared to the previous three years. In 2018 a record 6,047 fry were recorded, of which 4,025 were salmon fry and 2022 were trout fry. This is a 564% increase on the previous year (2017) in the number of salmon fry recorded, and a 7% increase in the number of trout fry recorded.

	2018 Trout	2018 Salmon	2017 Trout	2017 Salmon	2016 Trout	2016 Salmon	2015 Trout	2015 Salmon
Number of sites surveyed	157		136		138		89	
Total numbers of salmonids recorded	2606	4257	2034	678	614	551	1412	700
Total number of fry recorded	2022	4025	1890	606	451	461	1118	631
Total number of parr recorded	584	232	144	72	163	90	294	69
Number of sites with fry	127	84	115	52	92	61	82	38
Average number of fry per site	13	26	14	4	3	3	10	4
Number of sites with no salmonids present	24	67	13	75	29	66	4	48
Number of sites with no fish present	3		5		2		0	

Table 3: Summary of data from WCRT fish surveys, over the years 2015-2018. The grey column and bold type highlights this year's (2018) results.

4.1.3 Figure 8 shows the total number of salmonids recorded over the four years of surveying, the red line depicts salmon fry and the blue line trout fry. 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, but since 2016 have steadily increased. Salmon have stayed consistently low with a small dip in 2016 and then a large increase between 2017 and 2018 in the numbers of salmon fry recorded whilst surveying.

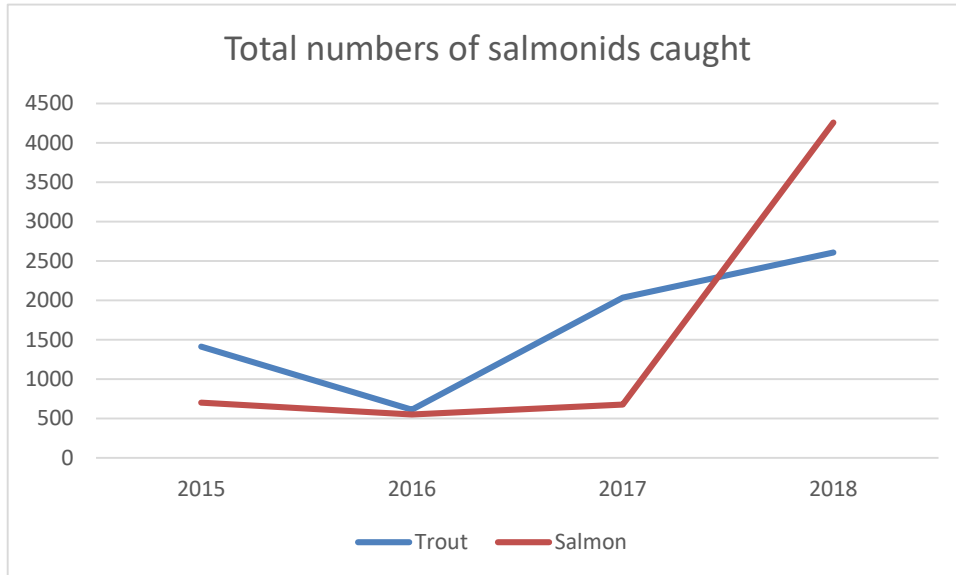


Figure 8: A diagram to show the total numbers of salmonids recorded between 2015 and 2018 during the surveys. The red line represents salmon and the blue line represents trout.

4.1.4 To confirm this trend isn't 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 9. Again salmon fry represented by the red line and trout fry by the blue line. The trend lines look pretty similar, just trout differs with 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.

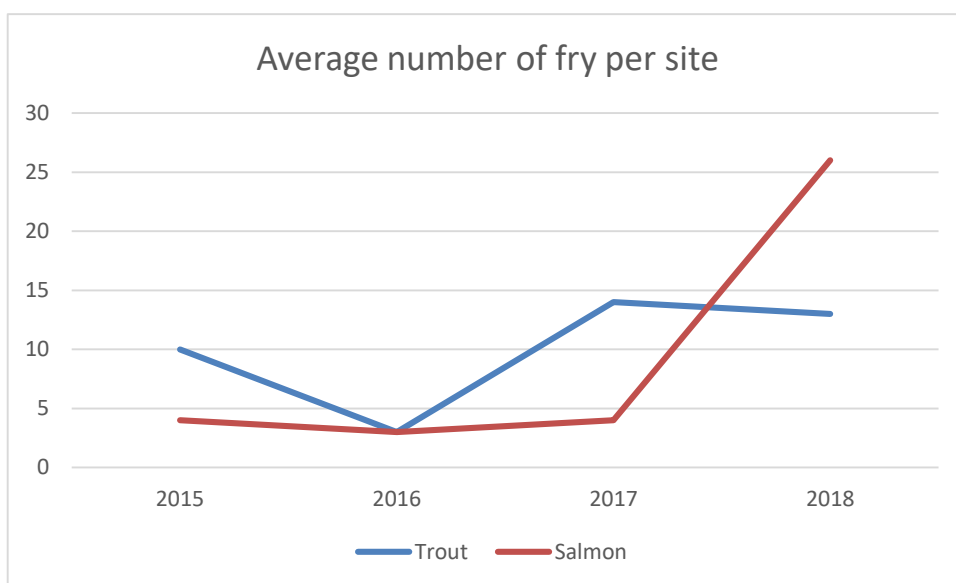


Figure 9: A diagram to show the average number of fry per site for each of the 4 years of surveying. Red line represents salmon and the blue line represents the trout.

4.1.5 The reason for the large increase in salmon is mainly down to the 27 main river sites that were surveyed in 2018, but weren't surveyed in 2017 due to persistent high flows. As shown in Table 4, the main river sites contributed 49% of the total salmon fry recorded during the 2018 survey season. The main river contributions can be further broken down and can be seen in Table 5, which shows the four main rivers within the catchment and their contribution to the 49% of salmon fry recorded in the 2018 season.

Which part of catchment	% of total salmon recorded
Main River sites (27 sites)	49%
Glenderamackin (plus Trout Beck, Mosedale and Barrow Beck) (11 sites)	15%
St John's Beck (3 sites)	14%
Whit Beck, Lorton (4 sites)	7%
Naddle Beck (4 sites)	3%
Upper Derwent (Borrowdale & Tributaries) (7 sites)	2%
Newlands (6 sites)	2%
Glenderaterra (4 sites)	2%
Other Tributaries (18 sites)	6%

Table 4: Summary of the contributions of different parts of the catchment made, to the percentage of total salmon fry recorded during the 2018 survey season.

Main River Sites	% of total salmon recorded
Derwent downstream of Bassenthwaite Lake (14 sites)	24%
Derwent between Bassenthwaite Lake and Derwentwater (2 sites)	8%
Cocker (7 sites)	13%
Greta (2 sites)	2%
Marron (2 sites)	2%

Table 5: Summary of the contributions of the Derwent, Cocker, Greta and Marron to the 49% of salmon recorded during the 2018 survey season.

- 4.1.6 The main reason for the large increase between previous years and the 2018 survey season in the number of salmon fry recorded is mainly down to these 27 main river sites. Normally the main river sites can't be surveyed due to high and fast flows which would lead to poor catch efficiency and for the safety of the survey team. However due to the low river levels at the start of the season, the opportunity arose to survey these sites. Another possibility for the high proportion of salmon fry recorded at the main river sites is because as water levels dropped and receded, the survival instinct kicked in and salmonids dropped downstream, out of the tributaries and into the main rivers, to where there was more water present. 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.
- 4.1.7 The spatial distributions of salmon and trout fry across the Derwent catchment recorded during the 2018 survey season can be seen in Figures 10 and 11, on pages 24 and 25. In the diagrams the sites have been given a grade according to the NFCS scheme. "A" being in the top 20% of fisheries of this type in England and Wales, and "E" being the bottom 20% of fisheries of this type in England and Wales. "F" being no fish present, in this case no salmonids present. "A" is dark blue in colour, green being middle of the range, "E" in orange and "F" is red. The size of the circles has also been adjusted to try and make it look proportional, the smaller the circle the fewer fry recorded and the larger the circle, the more fry recorded.
- 4.1.8 Figure 11 confirms what is shown in Tables 4 & 5 and 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 aren't found in many of the smaller tributaries. Figure 10 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 tribs 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. Table 6 on page 22 summarises where in the catchment the trout fry are found and the percentage of the total trout fry recorded that those areas contributed.
- 4.1.9 Of the total 157 sites surveyed, 127 sites (81%) had trout fry present and 84 (54%) had salmon fry present. 70 sites (45%) had adult European eels (*Anguilla anguilla*) or elvers (young eels) present, 109 sites (69%) had minor fish species present such as lamprey, sticklebacks, minnows, stone loach, and bullhead. One signal crayfish was caught in a net on St John's Beck, a known area for signal crayfish. Just three sites had no fish at all, even minor species and these were: Coledale Beck u/s of Force Crag Mine, Gale Gill upstream of Burnside Caravan Park and the Upper Derwent at Seathwaite Bridge.
- 4.1.10 Gale Gill flows into Lair Beck upstream of Burnside Caravan Park. Culverting through the caravan site is likely to be preventing fish getting up this far, as they have been found downstream of this site and the habitat is sufficient and comparable to other areas with fish present. Coledale Beck, flows through Braithwaite. The survey site is at the head of the catchment upstream of Force Crag Mine. Work has occurred up here to reduce the amount of heavy metals flowing into the beck. Fish have started to return to the beck as at the site downstream of the mine, trout have been found. But they haven't quite made it up as far as this site. The site at Seathwaite Bridge on the Upper Derwent, also has no fish present, this isn't due to any barriers, as fish are present upstream and downstream, but most likely due to poor habitat, as it is very exposed, has an unstable river bed and is known for drying up in this section because the river is modified and not in its natural channel at the low point on the floodplain.

4.1.11 Full details of numbers and types of fish recorded at each site can be found in Appendix B on page 98.

Which part of catchment	% of total trout fry recorded
Main River sites (27 sites)	2.9%
Glenderamackin (plus Trout Beck, Mosedale and Barrow Beck) (16 sites)	8.3%
St John's Beck (3 sites)	0.3%
Whit Beck, Lorton (6 sites)	7.4%
Naddle Beck (3 sites)	1.2%
Upper Derwent (Borrowdale & Tributaries) (11 sites)	5.0%
Newlands (11 sites)	9.1%
Glenderaterra (4 sites)	3.6%
Cocker Tribs (Tom Rudd & Bitter Beck), (6 sites)	5.9%
Lorton Valley (Hope Beck, Liza Beck,) (8 sites)	7.8%
Marron Tribs (8 sites)	14.5%
Broughton Beck & Tribs (6 sites)	1.1%
Bass Lake Tribs (14 sites)	1.8%
Other sites (19 sites) Loweswater, Crummock, Blumer, Derwentwater Tribs	15.2%

Table 6: Summary of the contributions of different parts of the catchment made, to the percentage of total trout fry recorded during the 2018 survey season

4.1.12 Figure 12 on page 26 shows the distribution of eels across the Derwent catchment during the 2018 survey season. The majority of the eels were found in the main rivers Derwent and Cocker, with some found in the Marron and Greta, but not many. Some were found in smaller tributaries but these tended to be towards the lower part of the catchment such as, Broughton Beck, Lostrigg, Blumer Beck, Tom Rudd Beck, Wythop Beck. Not many made it upstream of the lakes,

but one or two were found on Gatesgarth Beck, Coledale Beck, Upper River Glenderamackin, St John's Beck, Dash and Chapel Becks.

4.1.13 As seen in Figures 10 and 11 each site is given a grade according the NFCS scheme; Table 7 shows the number of sites within the River Derwent catchment for each grade each of the NFCS scheme, and compares 2018 to the previous three years.

Classification	Trout 2018	2017	2016	2015	Salmon 2018	2017	2016	2015
A	21	29	15	25	17	1	4	4
B	34	24	29	24	12	5	3	7
C	22	31	12	15	17	6	16	10
D	19	16	22	10	15	10	22	8
E	32	12	22	6	25	27	23	7
F	29	24	48	9	71	87	80	53
Total	157	136	148	89	157	136	148	89
			(Includes EA data)				(Includes EA data)	

Table 7: Number of sites within the River Derwent catchment in each category of the NFCS scheme for 2015, 2016, 2017 and 2018.

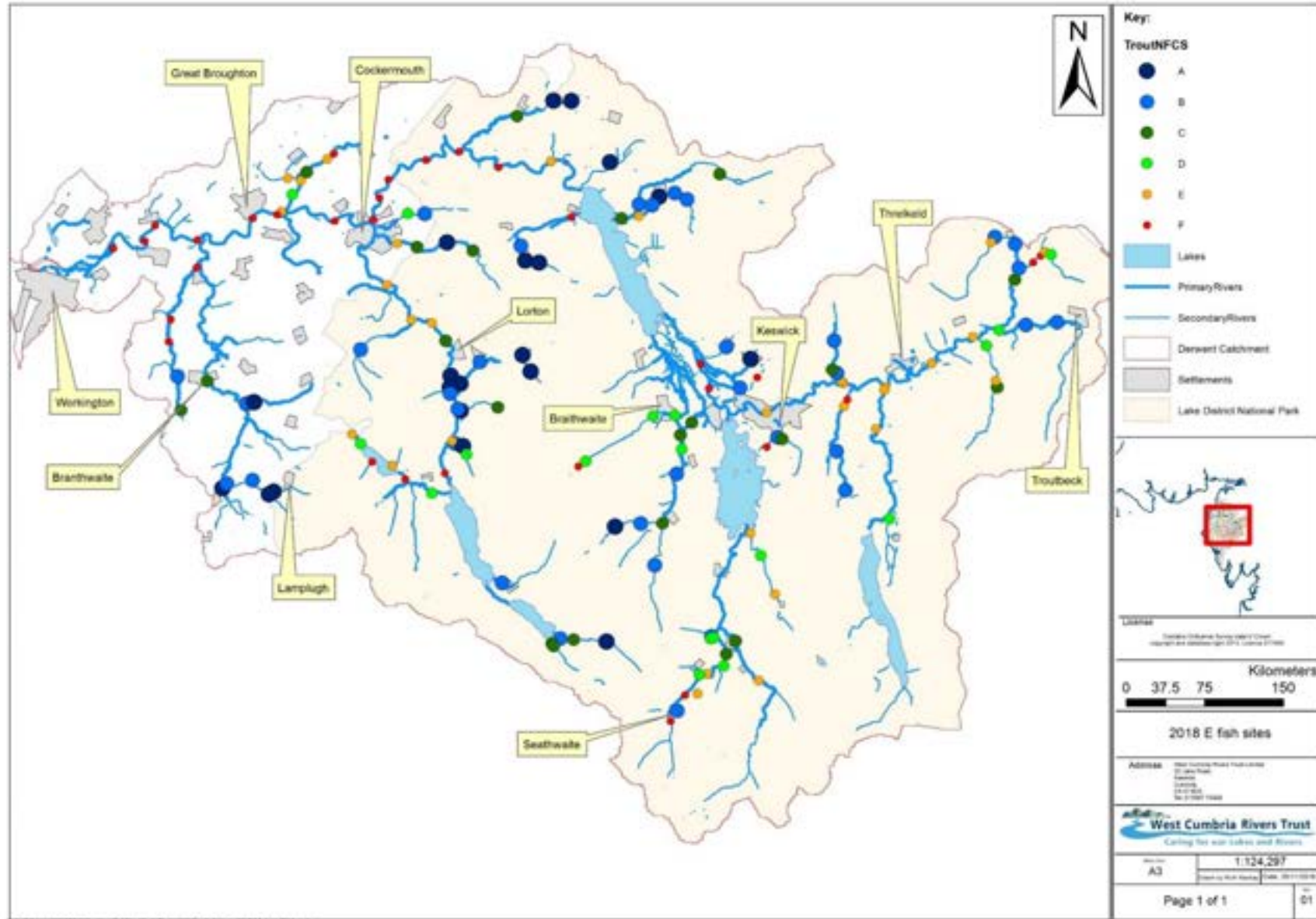


Figure 10: A map of the distribution of trout fry recorded during the 2018 survey season. Blue being good and red being no trout found.

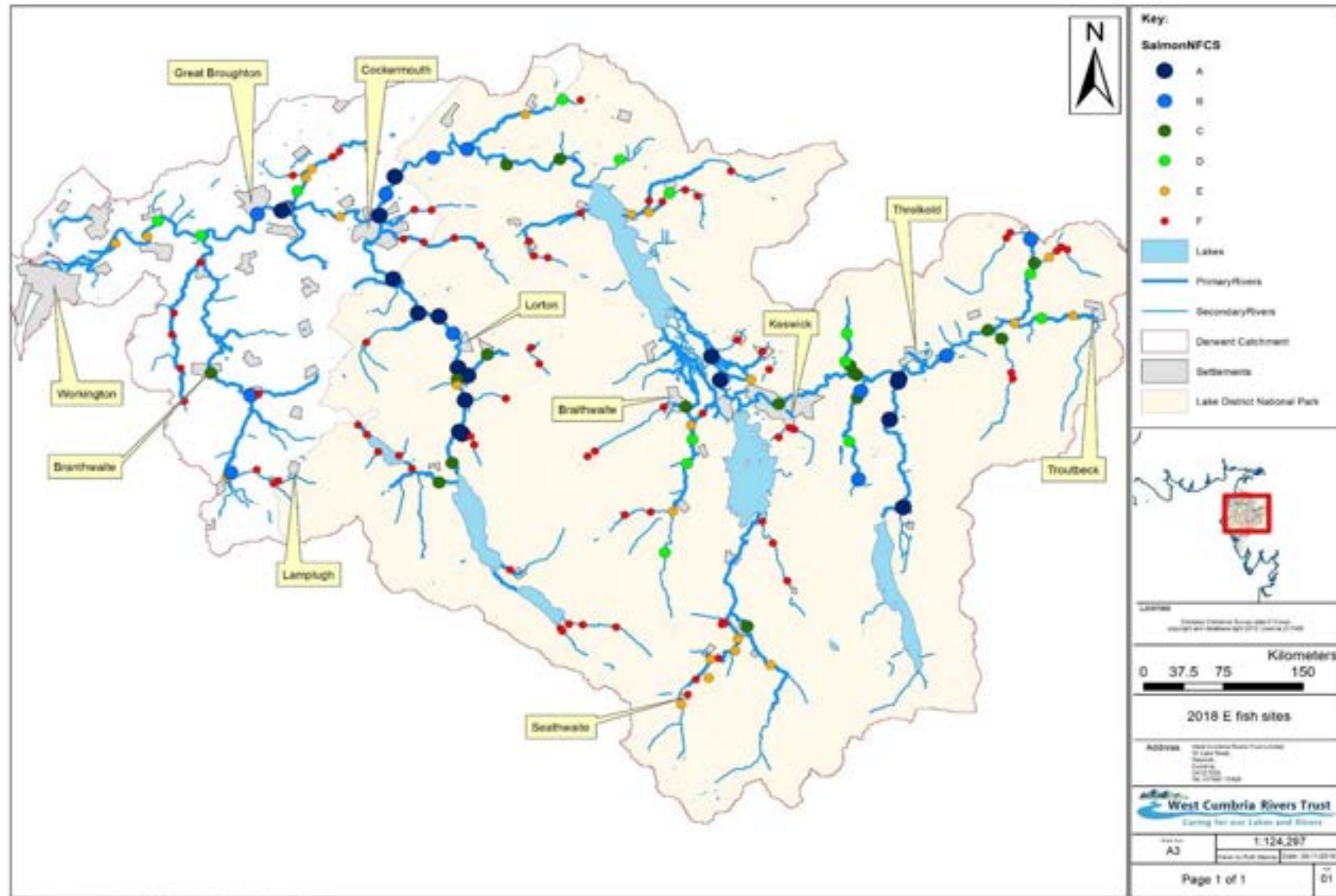


Figure 11: A map showing the distribution of salmon fry recorded during the 2018 survey season. Blue being good and red being no salmon found.

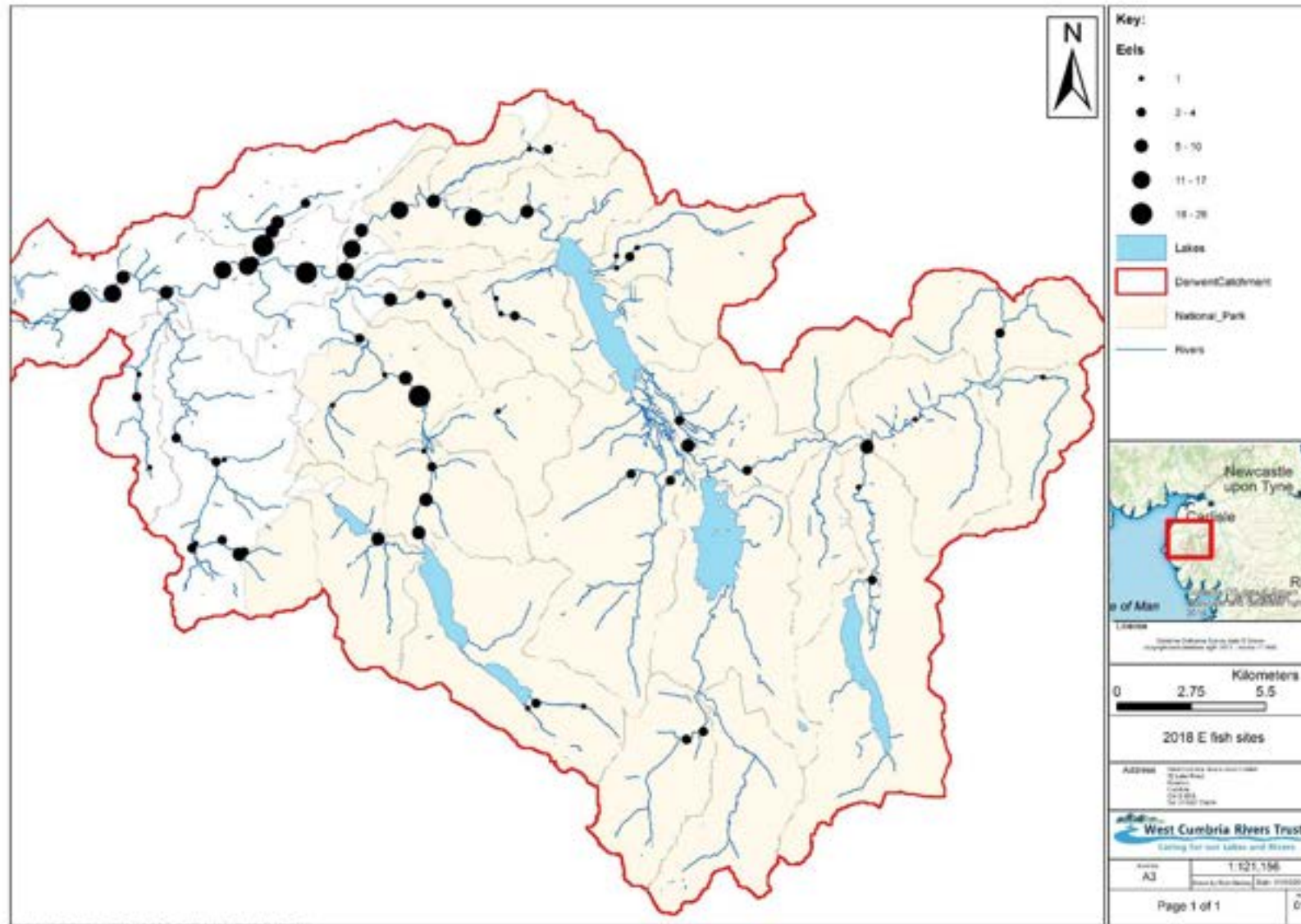


Figure 12: A map showing the distribution of Eels recorded within the Derwent Catchment during 2018 survey season.

5 Site Specific Results and Discussion

5.1 Background

5.1.1 To discuss the results in more detail the following sections have been broken down into sub catchments; the Marron, the Cocker, the Greta, Borrowdale, the Derwent between Bassenthwaite Lake and Derwentwater, and finally the Derwent downstream of Bassenthwaite Lake.

5.1.2 In the following sections which discuss the results in more detail, maps will be used which look like Figure 13. Each series of 4 dots or circles represents 1 site. The colours correspond to the different grades in the NFCS scheme shown in Figure 3. The first dot is 2018's data, the second dot is 2017's, third dot is 2016 and fourth dot is 2015. Any black dots represent no data, which means the site was not surveyed that year.

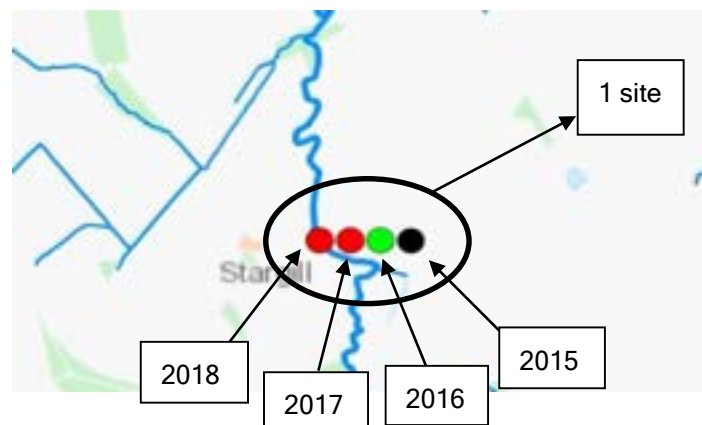


Figure 13: A diagram to show how to interpret any maps in the following results sections which show the NFCS grades for each site for the last four years

5.1.3 Please note that a direct comparison of sites from year to year is not statistically robust for the following reasons:

- 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,
- The data from the 2018 survey season hasn't been calibrated for the reasons stated within the report.

Whilst comparisons have been made, please bare these caveats in mind when looking at the data for individual sites.

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 A total of 13 sites were surveyed within this catchment and overall they contributed 16% towards the total number of trout fry recorded and 3% of the overall salmon fry recorded.

Lostrigg

5.2.3 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 we are monitoring it. Walkover surveys have been conducted off the back of the fish survey results 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, this year no salmonids were found downstream of Lostrigg High Bridge. Upstream of the bridge only trout were found, and these sites were graded B (Good) and C (Fair) for trout fry.

5.2.4 Figure 14 on page 29 shows the NFCS for trout, for each of the sites surveyed in the last four years in the lower part of the Marron catchment which includes the Lostrigg. Figure 15 on page 29 shows the NFCS for salmon, for each of the sites surveyed in the last four years for this same area. Salmon have never really had a presence on the Lostrigg over the four years of surveying; trout do, but their numbers are not as high as they should be.

Main River

5.2.5 The main river Marron has had four different survey sites over the years, but only two that are monitored yearly. 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. The main river is usually good for both salmon and trout fry, with the two sites surveyed this year graded B (Good) and C (Fair) for both trout and salmon. These sites can be seen on Figures 14 and 15. Over the 4 years the two sites have stayed consistently good or fair for both trout and salmon fry.

Marron Tributaries

5.2.6 The Marron has many smaller tributaries and most of them are surveyed even if it's just one site. This year they included: Black Beck, Colliergate Beck, Wood Beck, Rakegill Beck and Wisenholme Beck. In previous years Snary Beck and Far Stock Beck have also been surveyed. 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.

5.2.7 Figures 16 & 17 on page 30, show the survey sites on the upper tributaries of the Marron for trout and salmon respectively.

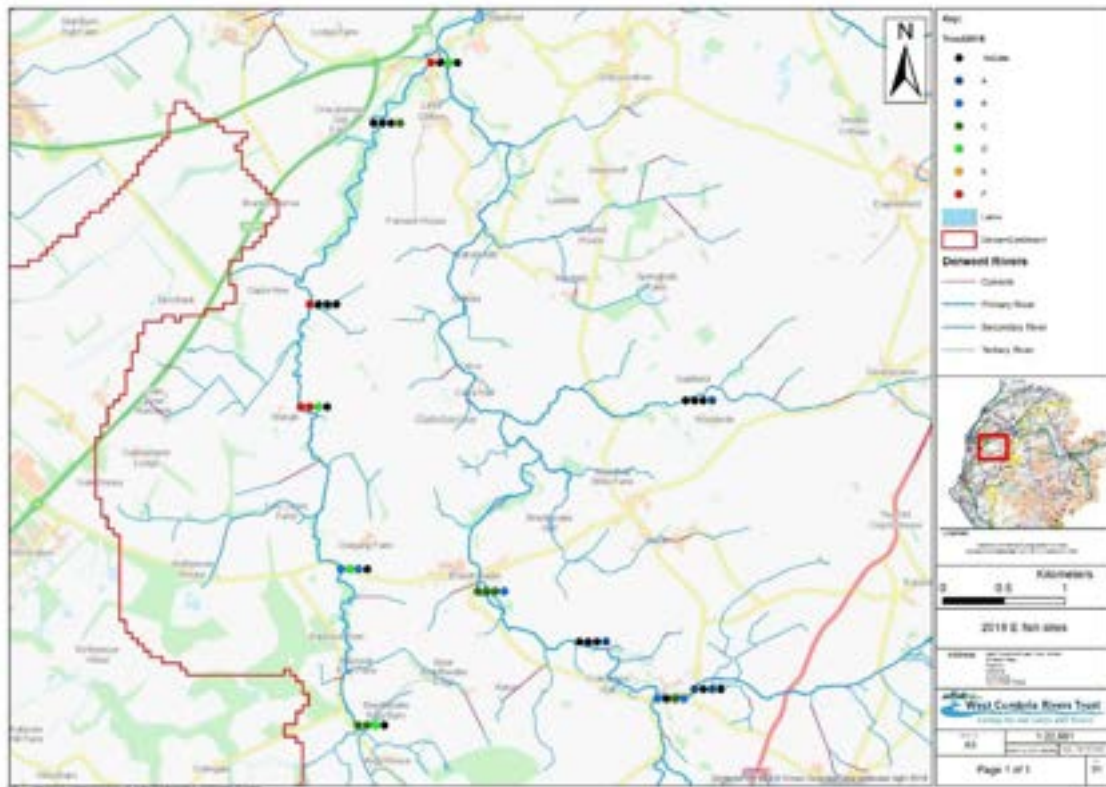


Figure 14: A diagram showing the sites surveyed on the Lostrigg and Lower Marron between 2015 and 2018, and the National Fisheries Classifications for trout.



Figure 15: A diagram showing the sites surveyed on the Lostrigg and Lower Marron between 2015 and 2018 and the National Fisheries Classification for salmon.



Figure 16: A diagram showing the distribution of sites on the Upper Marron and its tributaries between 2015 and 2018 and the National Fisheries Classification for trout.



Figure 17: A diagram showing the distribution of sites on the Upper Marron and its tributaries between 2015 and 2018 and the National Fisheries Classification for salmon.

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. A total of 39 sites were surveyed in this catchment in 2018 and overall they contributed 30% towards the total number of trout fry recorded and 22% of the overall salmon fry recorded.

Main River Cocker

5.3.2 The weather this season afforded us the opportunity to conduct seven main river sites on the River Cocker. These seven sites alone contributed 13% towards the total number of salmon recorded this season. Five of the seven sites got graded A on the NFCS scheme which is the best and classed as 'Excellent'. One got graded B which is classed as 'Good' and C which is classed as 'Fair'. In terms of trout the main river sites were less fruitful with the seven sites only producing 1% of the total trout fry recorded. One site was classed as F, which is classed as 'Fishless/ Absent', four E's (Poor), one B and one C.

5.3.3 The maps which show where these sites are, can be seen in the following sections. As the River Cocker itself is so large and covers such a wide area it has been broken down into sections and the maps also cover some of the tributaries which are still to be discussed.

Gatesgarth & Warnscale

5.3.4 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 seems to occur from a natural source 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.

5.3.5 Salmon aren't 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. Due to the absence of salmon in these becks the NFCS classification of these sites is F for salmon fry, trout fry on the other hand range from A-C. Figures 18 and 19 on page 32, show the survey sites and classifications for trout and salmon respectively.

Mill Beck

5.3.6 Mill 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. Again this is another tributary which contains trout but not salmon. On the NFCS the classification for these sites is B for trout fry ('Good').

5.3.7 Figures 20 & 21 on page 33, show the survey sites on Mill Beck, and the NFCS classifications over the last 4 years for trout and salmon respectively.



Figure 18: A diagram showing the distribution of sites on Warnscale and Gatesgarth Becks between 2015 and 2018 and the National Fisheries Classification for trout.

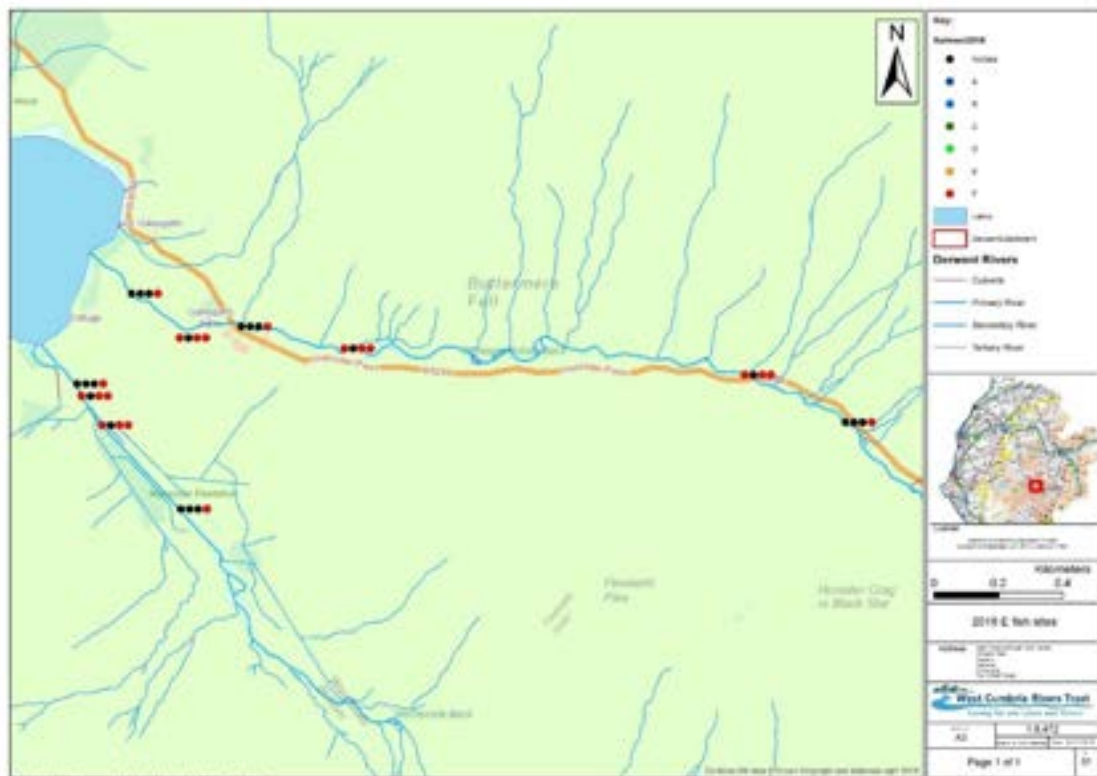


Figure 19: A diagram showing the distribution of sites on Warnscale and Gatesgarth Becks between 2015 and 2018 and the National Fisheries Classification for salmon.



Figure 20: A diagram showing the distribution of sites on Mill Beck, Buttermere between 2015 and 2018 and the National Fisheries Classification for trout.



Figure 21: A diagram showing the distribution of sites on Mill Beck, Buttermere between 2015 and 2018 and the National Fisheries Classification for salmon.

Loweswater

- 5.3.8 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.
- 5.3.9 Monitoring occurs on three tributaries which flow into the lake, and sites on Dub Beck, which changes name to Park Beck. The survey sites are shown in Figures 23 & 24 on page 35. Figures 23 and 24 also show the NFCS classification for the sites for the last 4 years for trout and salmon respectively.
- 5.3.10 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 with a classification of C (Fair) in 2018. Trout on the other hand do have a presence upstream of the lake but this varies from year to year with good and bad years.

Liza Beck

- 5.3.11 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.



Figure 22: A photograph from 2016 of the drop between the concrete cap and the river bed on Liza Beck. Also shows the attempts at fish easement but this has since deteriorated further.

- 5.3.12 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 local amenities, 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 (see Figure 22). Fish and eel passage was addressed by WCRT but post Storm Desmond the fish passage has deteriorated.
- 5.3.13 As shown in Figure 26 on page 36, salmon fry are not found upstream of this barrier to fish passage, but are found downstream and despite the drought this year had a classification of A (Excellent) on the NFCS scheme. Trout fry can be found upstream of the barrier, and they have varied over the years between Good and Fair classifications, the two sites upstream of the barrier this year were classed as A and D for trout fry. The numbers of trout fry recorded decrease between the lower sites and the upstream sites, which can be seen on Figure 25. Figures 25 and 26 also show the two most upstream main river sites on the Cocker - Lanthwaite Wood and Cornhow - which were discussed earlier in this section.



Figure 23: A diagram showing the distribution of sites around Loweswater between 2015 and 2018 and the National Fisheries Classification for trout.



Figure 24: A diagram showing the distribution of sites around Loweswater between 2015 and 2018 and the National Fisheries Classification for salmon.

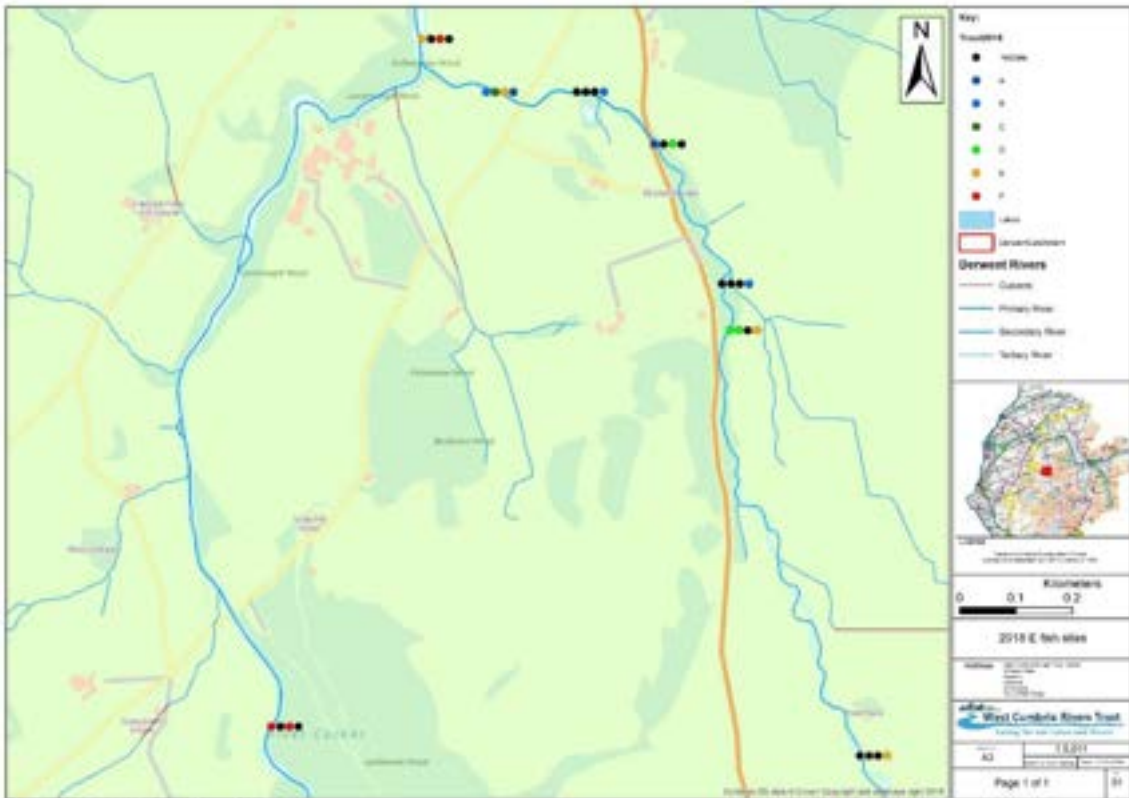


Figure 25: A diagram showing the distribution of sites on Liza Beck and two sites on the River Cocker between 2015 and 2018 and the National Fisheries Classification for trout.

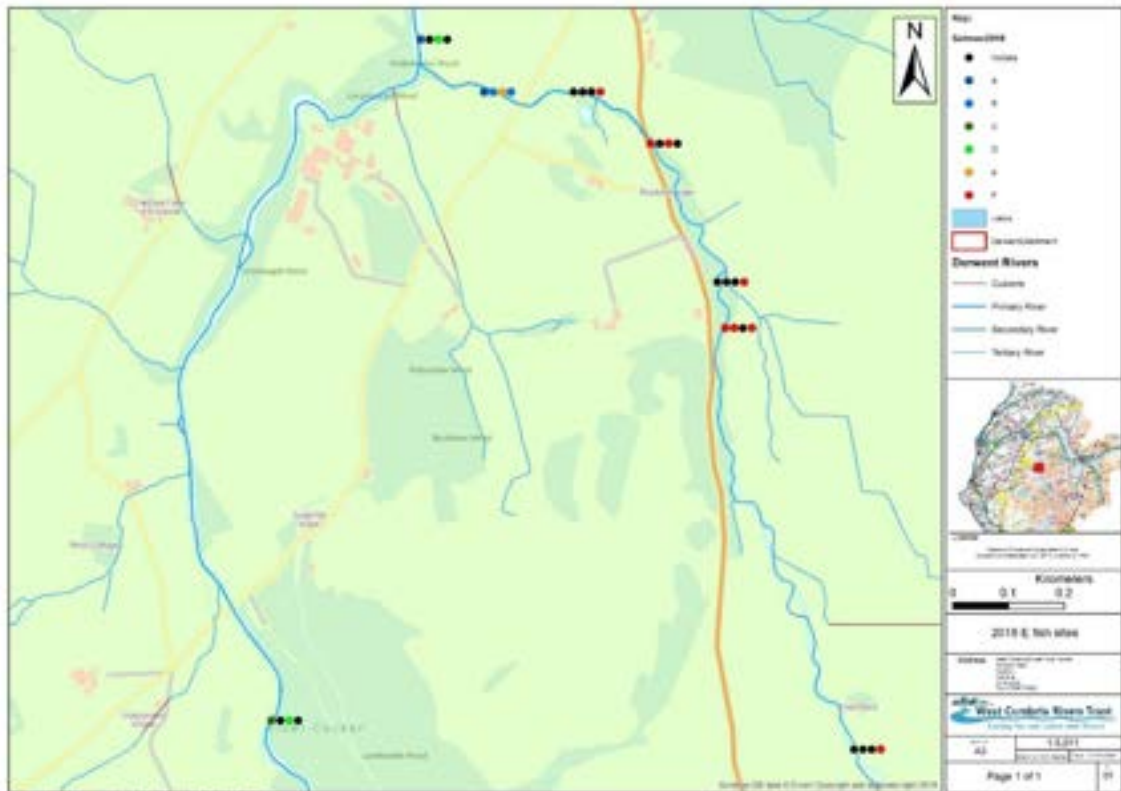


Figure 26: A diagram showing the distribution of sites on Liza Beck and two sites on the River Cocker between 2015 and 2018 and the National Fisheries Classification for salmon.

Hope Beck

- 5.3.14 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.
- 5.3.15 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.
- 5.3.16 Hope Beck should be better for salmon than it is. Although salmon were recorded at the sites at Hopebeck House and Hopebeck Bridge in 2017 their numbers were low, giving a classification of E (Poor) on the NFCS scheme. During the 2018 survey season no salmon were recorded at these two sites. Trout however fair better in Hope Beck with most sites surveyed being classed between A-C over the years. The two sites surveyed this year were classed as A at Hopebeck Bridge and C up on the fell upstream of the village of Hopebeck.

Figures 28 and 29 on page 39, both show the results for trout and salmon respectively for Hope Beck and a main river Cocker site, which is situated just downstream of the Hope Beck confluence.

Whit Beck

- 5.3.17 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. The old course and new course are depicted on Figures 28 and 29 on page 39.
- 5.3.18 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. Figures 28 and 29 show the survey sites. Numbers of both trout fry and salmon fry are good with NFCS classifications ranging from A to D across the four years. There are three sites regularly surveyed within the restoration section, and in 2018 the three sites were classified as A, C, A for trout and A, D, A for salmon. 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. The project is deemed a success and Whit Beck alone contributed 7% to the total salmon fry recorded and 7% of the total trout fry recorded during the 2018 survey season.
- 5.3.19 As well as the three sites within the restoration project area, there are 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 and off the back of Grisedale Pike and Ladyside Pike and then runs alongside Whinlatter Pass. The site in High Lorton is again good for both salmon and trout fry, with classifications in 2018 being B (Good) for trout and C (Fair) for salmon. The two sites further up on the tributaries Blaze Beck and Aiken Beck do not produce any salmon and are therefore classed as F, but trout fry are found at both these sites and have been given classifications of A in 2018.

Meregill Beck

- 5.3.20 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. 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.
- 5.3.21 There are two survey sites on Meregill Beck (shown on Figures 28 and 29), both sites are good for trout fry, with NFCS classifications of A and B. The downstream site is classed as C (Fair) for salmon fry and the upstream site is classed as E (Poor) for salmon fry. Salmon fry aren't thriving as well as the trout fry in Meregill, but maybe over time this may change.

Paddle Beck, Sandy Beck and Little Sandy Beck

- 5.3.22 Are all small tributaries of the Cocker that are usually surveyed in the programme, but due to the drought at the start of the season, all three suffered from dry river beds or being reduced to a murky trickle, which will have affected the fish. Therefore, no surveys were conducted on these three becks during the 2018 survey season, bar one site on Sandy Beck. Whilst this site was surveyed it was noted that the bed and some stones were all coated in this fine rust coloured powder like material which can be seen in Figure 27. Despite this, the site has actually been given a classification of B (Good) for trout fry, no salmon fry were found here.



Figure 27: A photo of the bed of Sandy Beck that was covered in this fine rust coloured material.

- 5.3.23 Figures 30 and 31 on page 40, show the sites on Paddle Beck, Sandy Beck and Little Sandy Beck that have been surveyed over the last four years along with four main river sites on the Cocker which were previously discussed earlier in this section. These three tributaries are poor for salmon fry with classifications switching between E (Poor) and F (Absent) over the years, bar the lower few sites on Sandy Beck where classifications are C's and D's (Fair). This reflects that these tributaries are currently not suitable habitat for salmon, and is where a lot of habitat improvement projects have taken place to try and remedy this. Trout fry on the other hand seem to do reasonably well in these tributaries with classifications ranging from A to E over the years. With just Paddle Beck showing lower numbers, especially at the upper two sites, which is mainly due to poor habitat and intermittent farm pollution.



Figure 28: A diagram showing the distribution of sites on Hope Beck, Whit Beck, Meregill Beck and one River Cocker site between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 29: A diagram showing the distribution of sites on Hope Beck, Whit Beck, Meregill Beck and one River Cocker site between 2015 and 2018 and the National Fisheries Classifications for salmon.



Figure 30: A diagram showing the distribution of sites on Paddle, Little Sandy and Sandy Becks, and the location of four River Cocker sites between 2015 and 2018 and the National Fisheries Classification for trout.



Figure 31: A diagram showing the distribution of sites on Paddle, Little Sandy and Sandy Becks, and the location of four River Cocker sites between 2015 and 2018 and the National Fisheries Classifications for salmon.

Bitter Beck & Tom Rudd Beck

- 5.3.24 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.
- 5.3.25 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 and 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. The drought at the start of the 2018 season definitely had an impact on Bitter Beck as walkovers conducted by colleagues during the drought noted lots of dead fish and no water or no running water in parts. For this reason, sites on Bitter Beck were surveyed at the end of the season once the weather had refilled the watercourse and also only sites upstream of the known area that had dried up were conducted.
- 5.3.26 Due to the lack of fish access to migrate upstream no salmon fry are found on either becks and the classifications for all sites over the four years for salmon fry is F (Absent), (Figure 33). Trout fry on the other hand are present and the classifications have varied from A to E over the years (Figure 32). In 2018 the two sites surveyed on Bitter Beck were classified as B (Good) and D (Fair) for trout fry. Tom Rudd Beck had four sites surveyed during 2018 and were classified as C, A, C, E going from upstream to downstream. At the most downstream site, fish numbers could be being affected by the intermittent pollution from the construction site.



Figure 32: A diagram showing the distribution of sites on Bitter Beck and Tom Rudd Beck between 2015 and 2018 and the National Fisheries Classifications for trout.

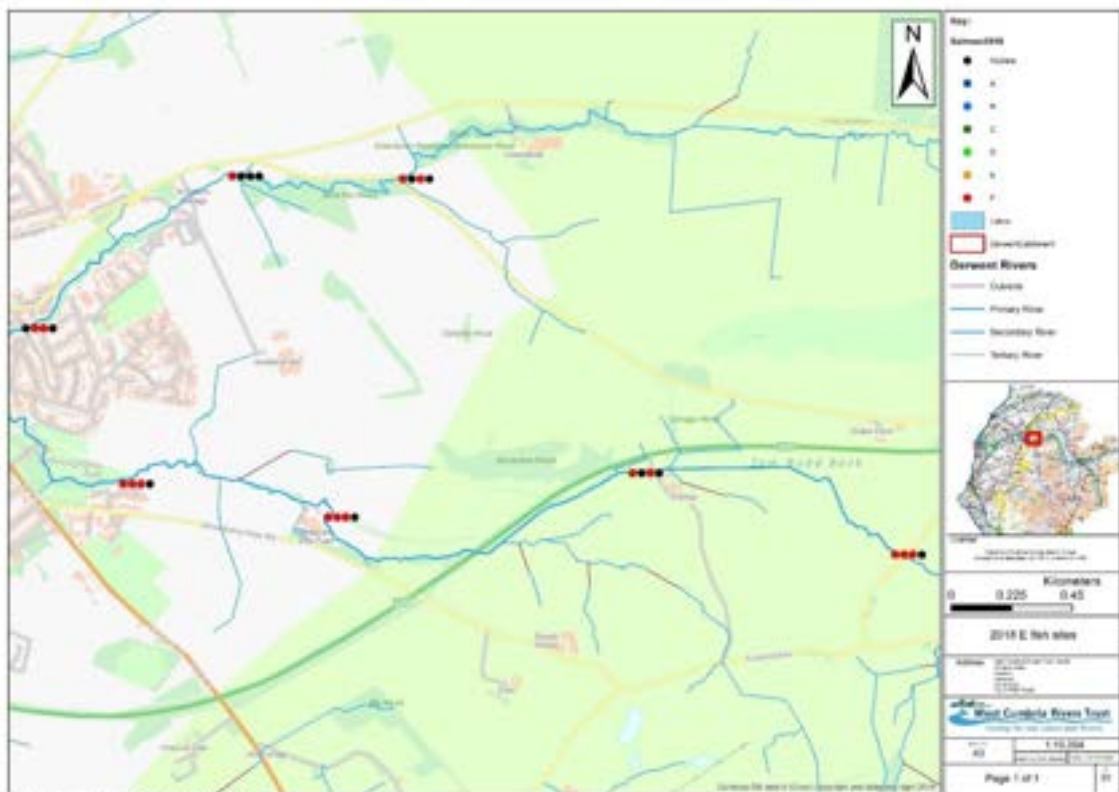


Figure 33: A diagram showing the distribution of sites on Bitter Beck and Tom Rudd Beck between 2015 and 2018 and the National Fisheries Classifications for salmon.

5.4 River Derwent downstream of Bassenthwaite Lake

Main River

- 5.4.1 The main River Derwent downstream of Bassenthwaite Lake is possibly one of the most fruitful sections in terms of salmon fry numbers. There were 14 sites surveyed on this section of the Derwent in 2018 and the 14 sites accounted for 24% of the total number of salmon fry recorded during the survey season. This section covers the main river from 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.
- 5.4.2 The fact the weather conditions allowed us this opportunity to survey these main rivers sites and the corresponding results from these sites, just shows us how important the main river is for salmon fry and why it is designated an SAC and SSSI. Again to reiterate, of the 4025 salmon fry recorded during the 2018 survey season, 24% were recorded at these 14 sites alone, that's a quarter of the total salmon fry recorded found at just 9% of the sites surveyed in the 2018 season.
- 5.4.3 Again similar to the Cocker, because this section of the main river covers a large area, the maps showing the distribution of sites and the NFCS classifications are broken down into several figures (Figures 34 to 43). Therefore, Table 8 is a summary of the NFCS classifications for these 14 sites for the 2018 season.

Site Name	NFCS Salmon	NFCS Trout
Brock Hole	C	E
Prior Wood	C	F
Isel Hall	B	F
Redmain Hall	B	F
Home Wood (Woodhall Farm)	A	F
Hamesbottom Wood (Woodhall Park)	B	F
Cockermouth Memorial Gardens	A	F
Papcastle	E	F
u/s Broughton High Bridge	A	F
Midtown Farm	B	F
Ribton Hall	D	F
Dangerous Wood, Camerton	D	F
Camerton Church	E	F
Coups Weir	E	F

Table 8: A summary of the NFCS classifications for salmon and trout for the 14 main river Derwent sites downstream of Bassenthwaite Lake for the 2018 survey season.

- 5.4.4 Table 8 shows that towards the lake the sites were classified as Fair, then they improved around Isel and Cockermouth, as most sites were classed as Good or Excellent, with the exception of Papcastle where more parr were recorded, which is why the fry classification fell to E (Poor). Then an increase back to Excellent and Good before decreasing again to Fair as the sites get closer to Workington, which shows that the closer you get to the estuary the less suitable the habitat is for spawning and fry, especially at Coups Weir where several smolts were recorded which hadn't quite made it out to sea yet.
- 5.4.5 The good salmon results from the main river sites also highlighted 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 Some main river sites have been surveyed before in 2016, these and the 2018 site survey locations and results are shown in Figures 34- 43 on the following pages.

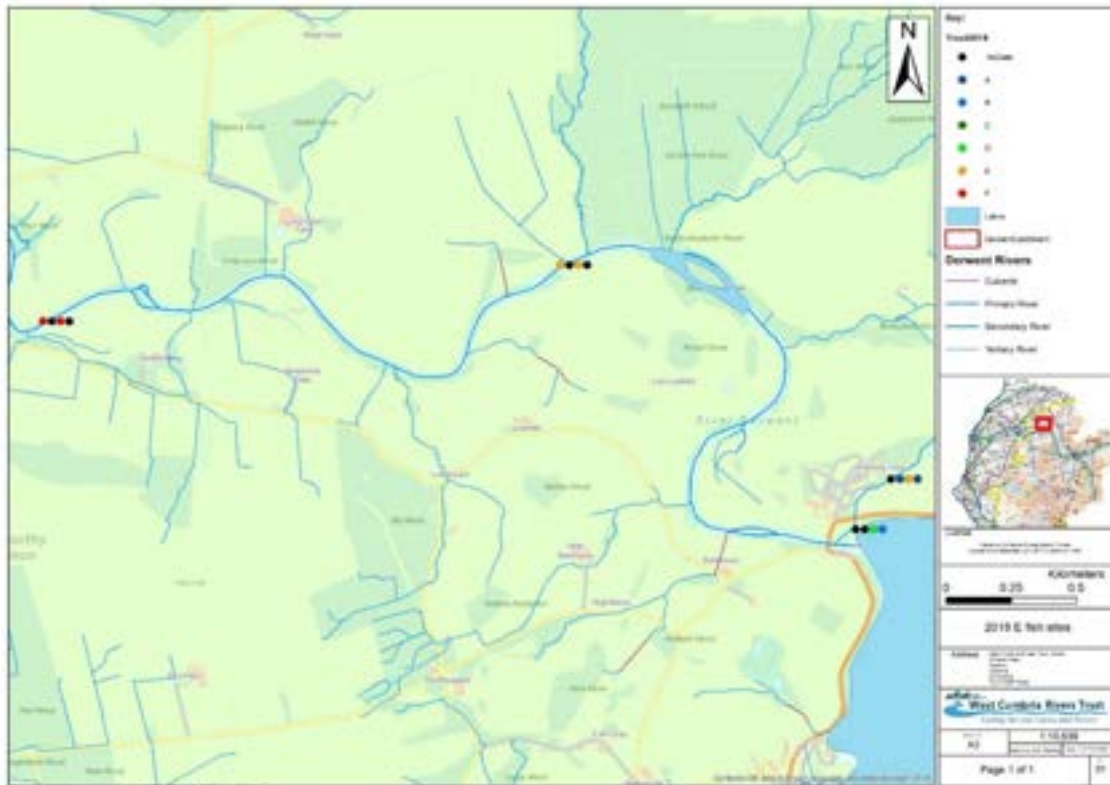


Figure 34: A diagram showing the distribution of sites on the Main River Derwent between Bassenthwaite Lake and Isel Hall, between 2015 and 2018 and the National Fisheries Classifications for trout.

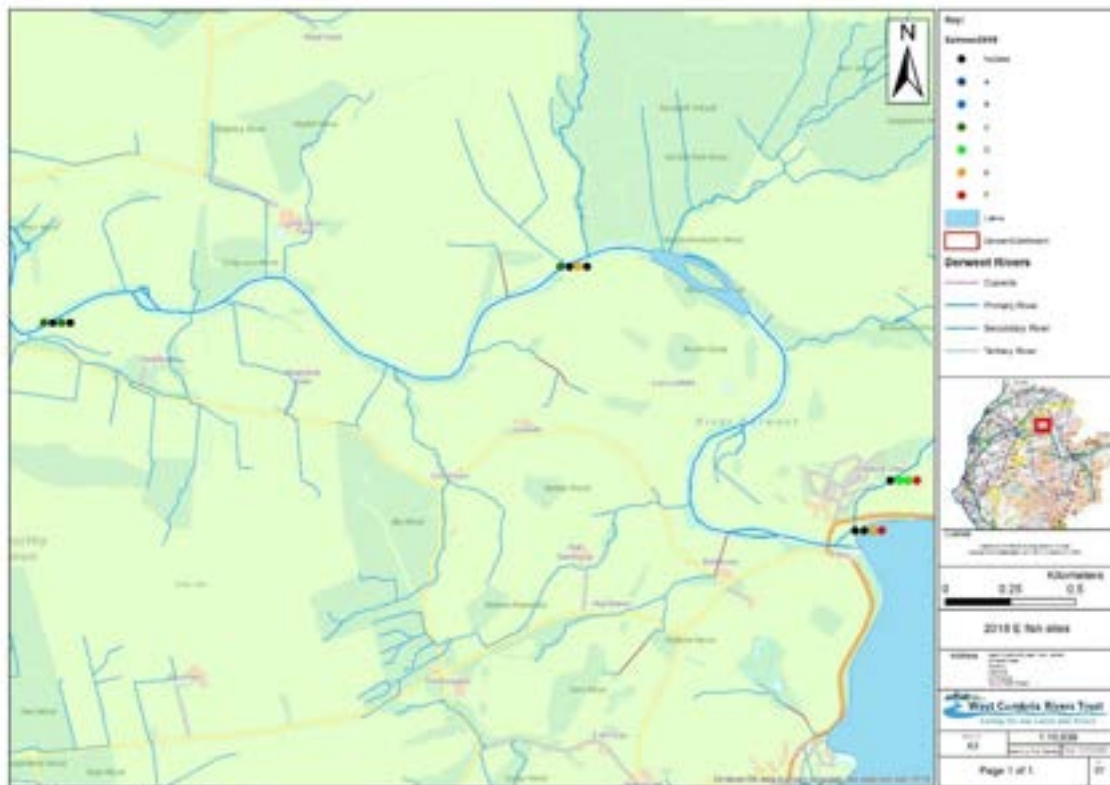


Figure 35: A diagram showing the distribution of sites on the Main River Derwent between Bassenthwaite Lake and Isel Hall, between 2015 and 2018 and the National Fisheries Classifications for salmon.

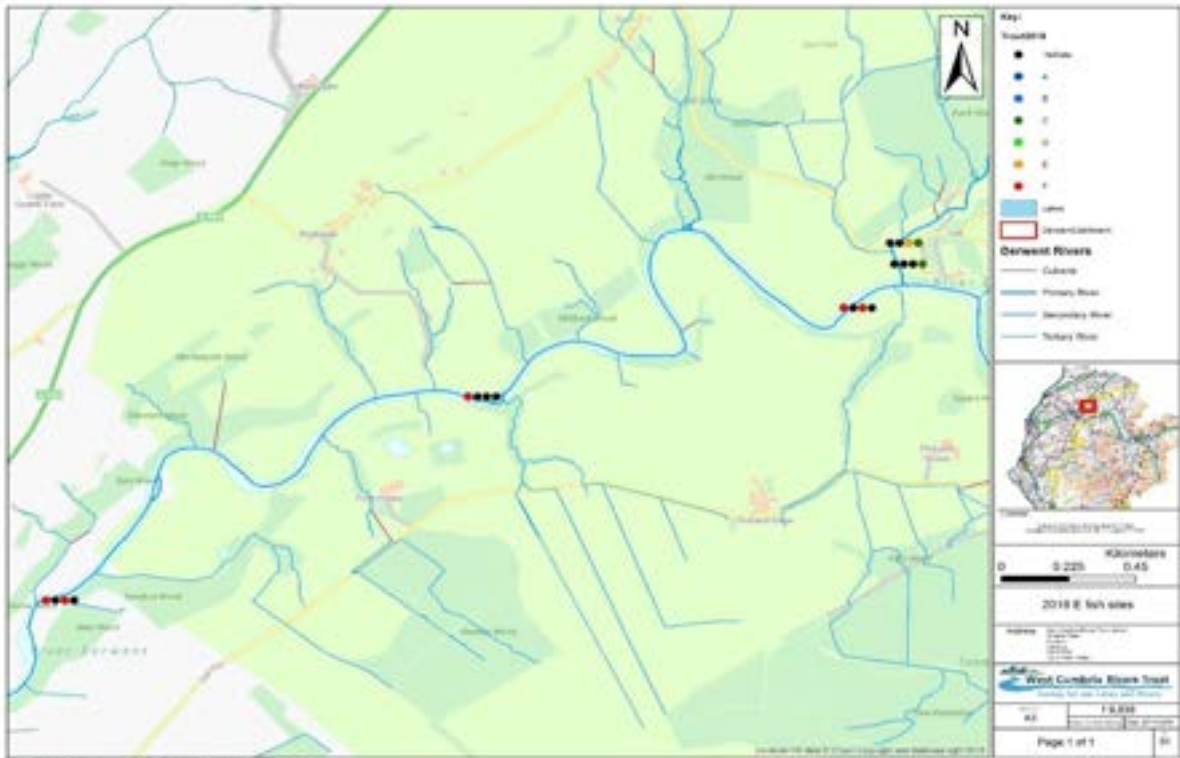


Figure 36: A diagram showing the distribution of sites on the Main River Derwent between Isel Hall and Home Wood, between 2015 and 2018 and the National Fisheries Classifications for trout.

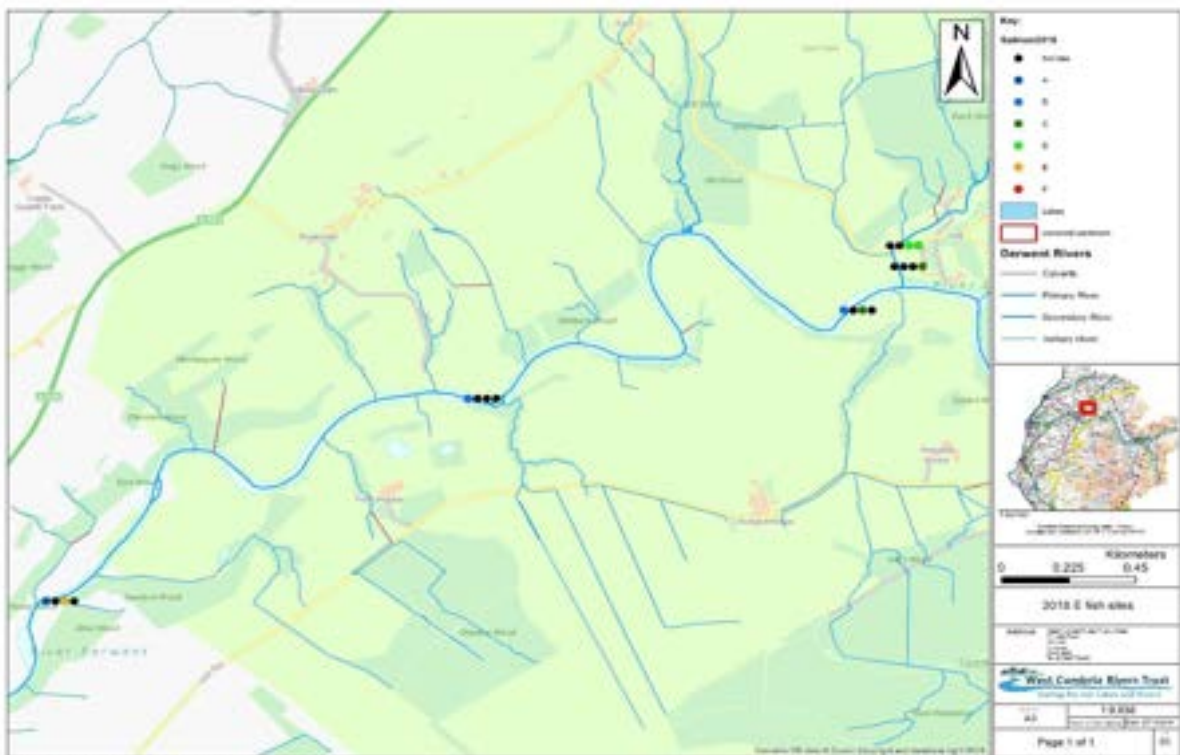


Figure 37: A diagram showing the distribution of sites on the Main River Derwent between Isel Hall and Home Wood, between 2015 and 2018 and the National Fisheries Classifications for salmon.



Figure 38: A diagram showing the distribution of sites on the Main River Derwent between Home Wood and Cockermouth, between 2015 and 2018 and the National Fisheries Classifications for trout.

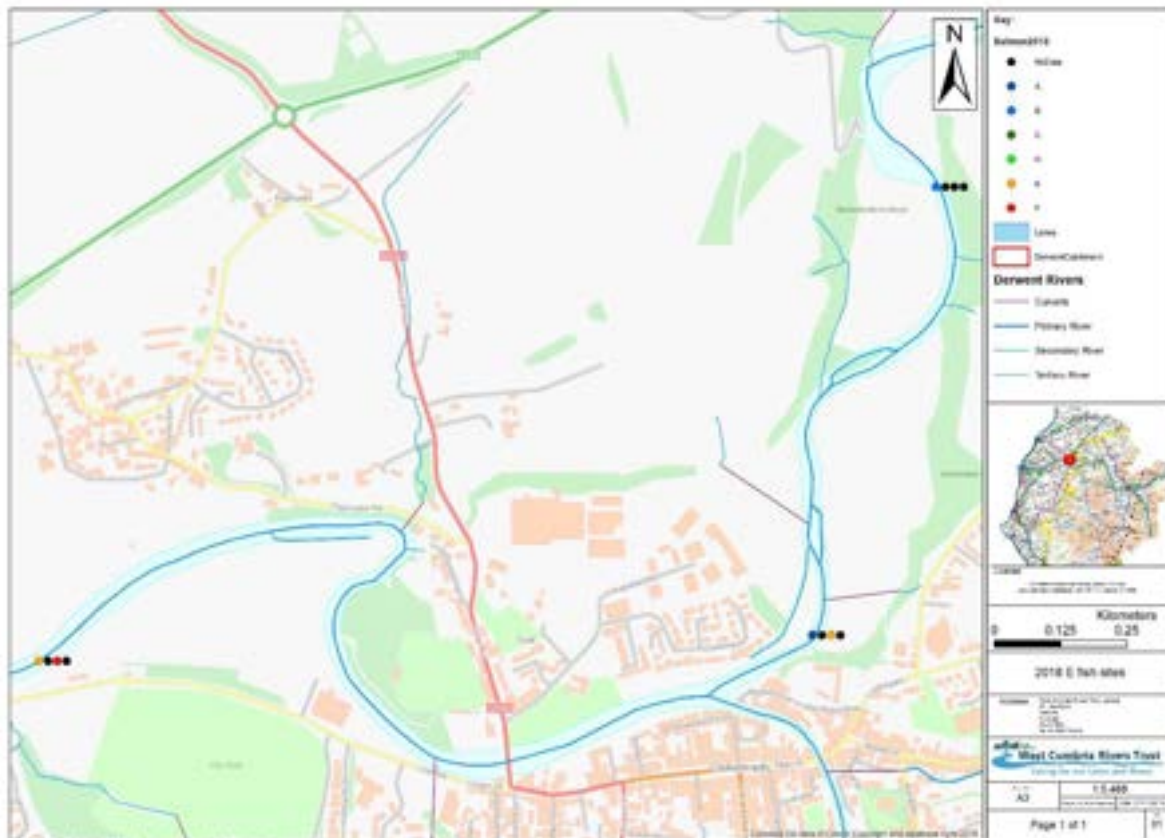


Figure 39: A diagram showing the distribution of sites on the Main River Derwent between Home Wood and Cockermouth, between 2015 and 2018 and the National Fisheries Classifications for salmon.



Figure 40: A diagram showing the distribution of sites on the Main River Derwent between Cockermouth and Brigham, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 41: A diagram showing the distribution of sites on the Main River Derwent between Cockermouth and Brigham, between 2015 and 2018 and the National Fisheries Classifications for salmon.



Figure 42: A diagram showing the distribution of sites on the Main River Derwent between Great Broughton and Coups Weir, between 2015 and 2018 and the National Fisheries Classifications for trout.

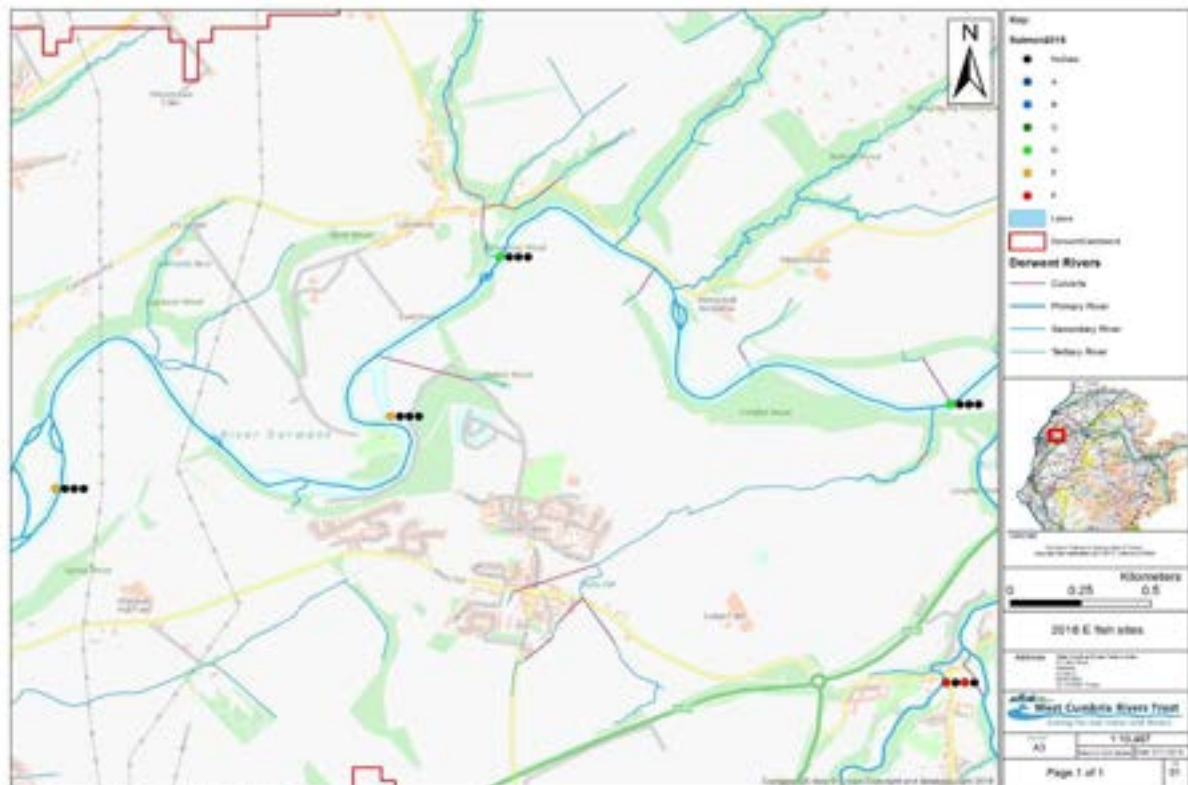


Figure 43: A diagram showing the distribution of sites on the Main River Derwent between Great Broughton and Coups Weir, between 2015 and 2018 and the National Fisheries Classifications for salmon.

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. A landowner in the vicinity of Priests Bridge has noted that the beck changes colour mid-afternoon every day which is an indication that something is getting into the beck that shouldn't.
- 5.4.9 Usually three sites are surveyed downstream of Priests Bridge and then one site on each of the three tributaries (Carr Beck, Dovenby Beck and Brides Beck). This year, two extra sites were added to Brides beck to determine whether two barriers to fish migration identified on walkover surveys are actually prohibiting fish passage. The sites on Carr Beck and Dovenby Beck weren't surveyed as the drought had affected these two tributaries significantly.
- 5.4.10 Figures 44 and 45 on page 51, show the distribution of sites on Broughton Beck and its tributaries and the NFCS classifications for the last four years. Salmon fry are found on Broughton Beck and some on Brides Beck but the classifications are only Poor or Fair, 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. Trout fry are also found on Broughton Beck and Brides Beck, and a few on Carr Beck once Carr Beck and Dovenby Beck join, but no trout fry are found upstream of the second obstacle on Brides Beck and further upstream on Carr Beck and Dovenby Beck, the classifications for trout fry have ranged over the years from B to E.

Blumer Beck

- 5.4.11 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.
- 5.4.12 Salmon can be found on Blumer Beck as far up as Beckgrains Bridge and the classifications for salmon fry this year were E (Poor) and D (Fair), which is a drop on previous years for these sites, however drought is thought to have had an impact on Blumer Beck as flows were noted as very low during the warm spell. Trout fry also had a lower classification at Blumer Bridge, but the same at Beckgrains Bridge. No salmon fry are found upstream at Scalegill Farm, however trout are found in abundance here and have a classification of A (Excellent). No sites downstream of Blumer Bridge were conducted this year due to access issues because of the construction works for United Utilities West Cumbria Supply Project. No fish are found upstream of the A591 which leads to suspicions that the road crossing is causing a barrier to fish passage, but this needs clarifying by conducting a walkover survey.
- 5.4.13 Figures 46 and 47 on page 52, show the distribution of survey sites along its course, along with the NFCS classifications for the last four years for trout and salmon respectively.



Figure 44: A diagram showing the distribution of sites on Broughton Beck, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 45: A diagram showing the distribution of sites on Broughton Beck, between 2015 and 2018 and the National Fisheries Classifications for salmon.



Figure 46: A diagram showing the distribution of sites on Blumer Beck between 2015 and 2018 and the National Fisheries Classifications for trout.

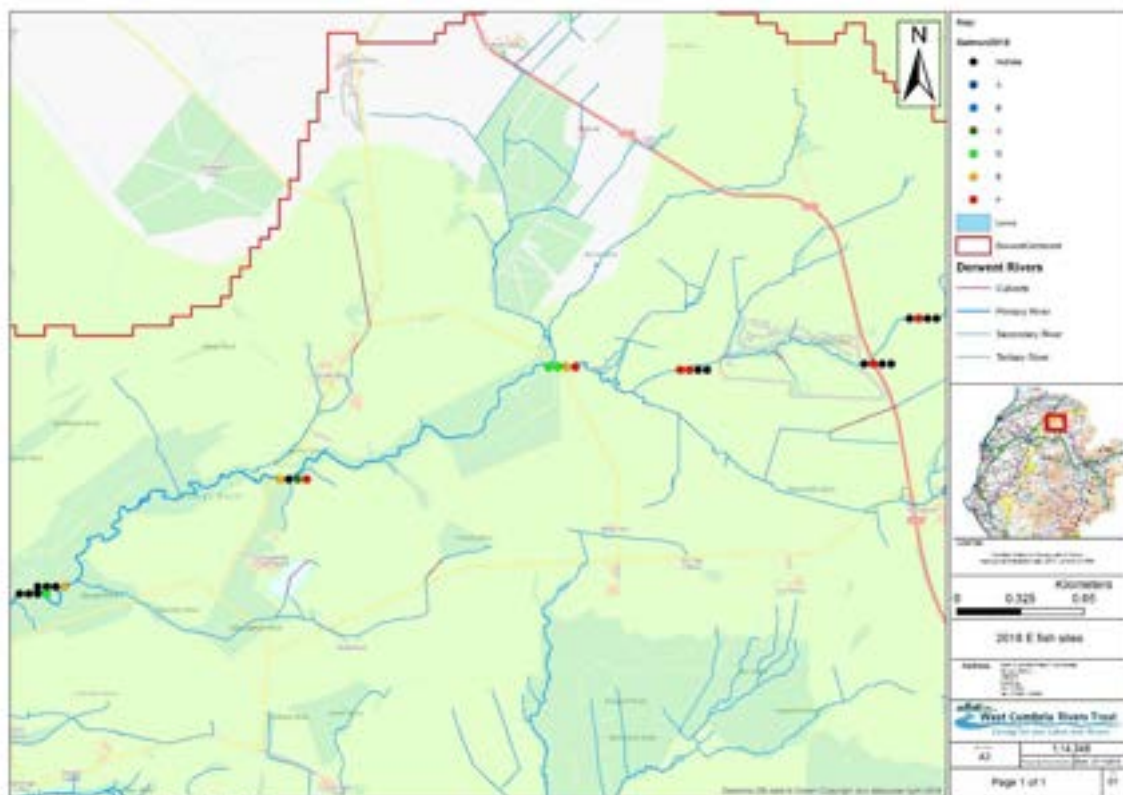


Figure 47: A diagram showing the distribution of sites on Blumer Beck between 2015 and 2018 and the National Fisheries Classifications for salmon.

Wythop Beck

- 5.4.14 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.
- 5.4.15 No salmon have been found on Wythop Beck, however, Wythop Beck is good for trout and for the last three years the classifications on the upper three sites have ranged from A to D (See Figure 49-50, p54). In 2018 the classifications were A, A, B going from upstream to downstream. The site 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 F for both trout and salmon. 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. Figure 48 shows some of the fish recorded at the Dubwath Silver Meadows site.



Figure 48: Three photos of fish recorded at Dubwath Silver Meadows, top left is a roach, top right a pike and bottom a trout parr. Photo credits: Martin Pullan ©

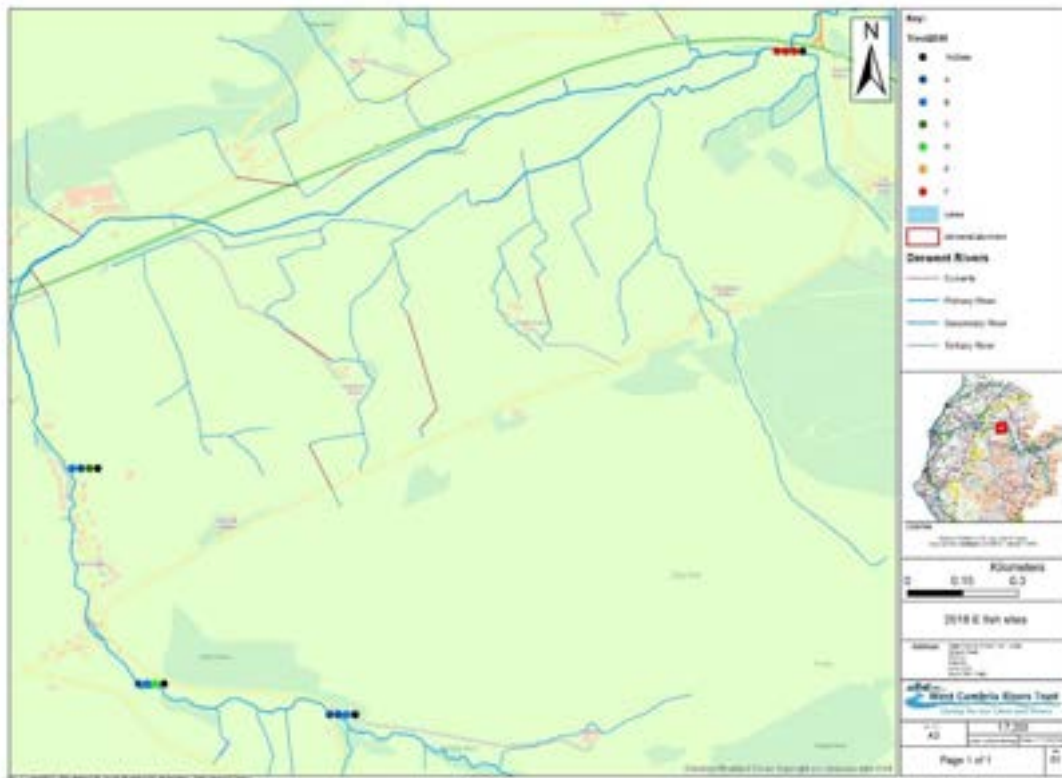


Figure 49: A diagram showing the distribution of sites on Wythop Beck between 2015 and 2018 and the National Fisheries Classifications for trout.

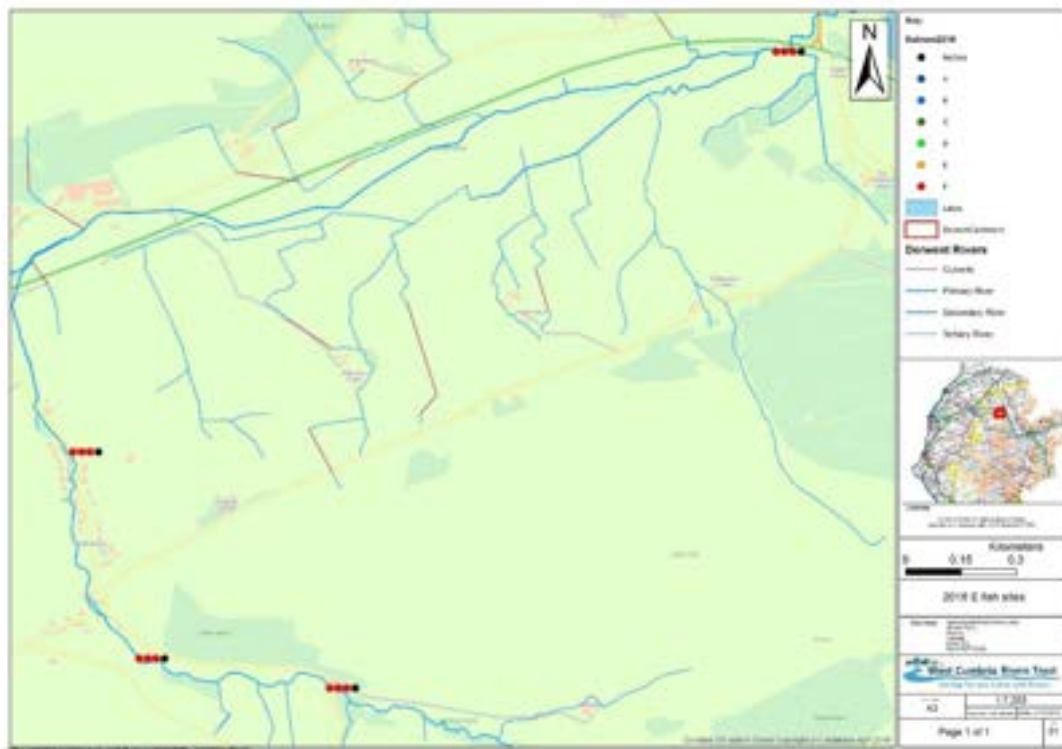


Figure 50: A diagram showing the distribution of sites on Wythop Beck between 2015 and 2018 and the National Fisheries Classifications for salmon.

Coal Beck

5.4.16 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.

5.4.17 Coal Beck regularly features on the survey schedule as it supports both salmon and trout. However, this year only one survey site was conducted up at Messengermire Woods as the day the surveys were scheduled the beck was running high and visibility was poor downstream of the construction site for the United Utilities West Cumbria Supply Project. It was hoped these sites could be revisited on a day when visibility was better but this wasn't achieved before the end of the survey season.

For the one site conducted on Coal Beck this year, the classification for salmon fry was D (Fair) and for trout fry was A (Excellent). These classifications and the location of the survey site plus sites from previous years and their classifications can be seen in Figures 51 and 52 on page 56.

Dash & Chapel Beck

5.4.18 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.

5.4.19 Both becks have had salmon recorded on them but the best classification over the last four years is D (Fair), salmon also tend to be found at the lowers sites on these watercourses and then trout tend to dominate further upstream (as would be expected). Trout are more prevalent on both becks with classifications ranging from A - F. Dash Beck is monitored every year by the EA as there is an abstraction on the watercourse. Chapel Beck has had some habitat improvement works undertaken and survey sites on this watercourse are to monitor the impact of this work on fish populations.

5.4.20 Figures 53 and 54 on page 57, show the distribution of sites on both Dash Beck and Chapel Beck, and the NFCS classifications for the last four years for trout and salmon respectively.



Figure 51: A diagram showing the distribution of sites on Coal Beck between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 52: A diagram showing the distribution of sites on Coal Beck between 2015 and 2018 and the National Fisheries Classifications for salmon.

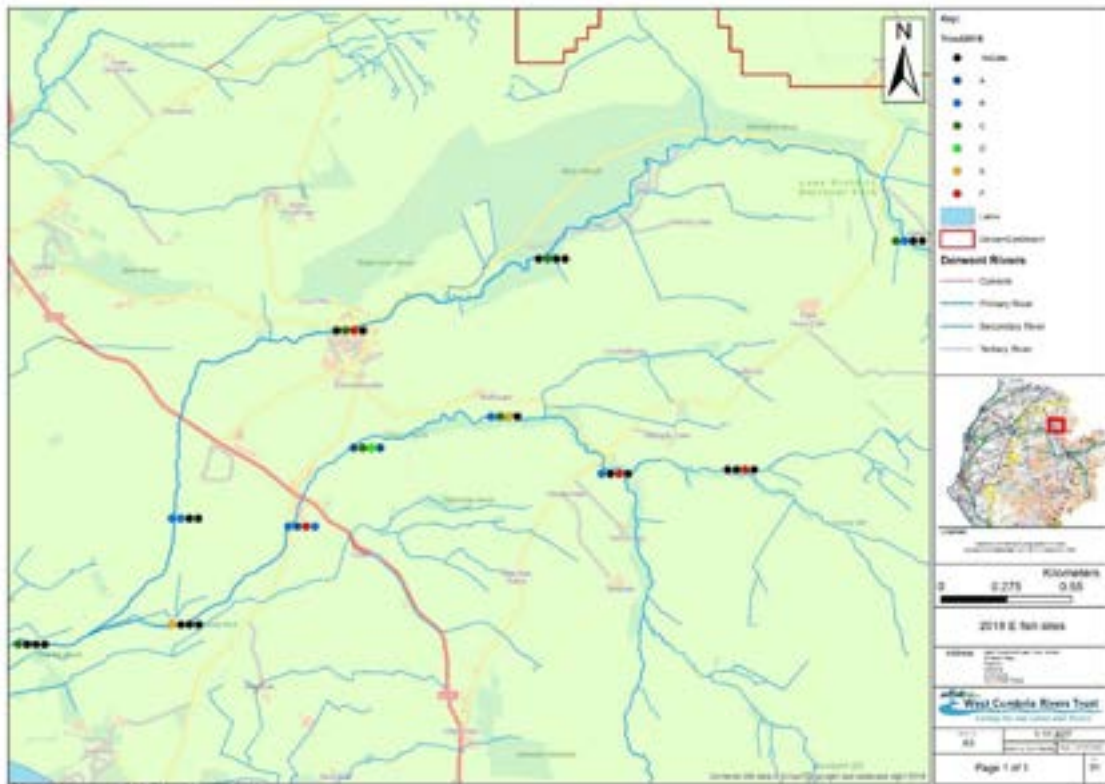


Figure 53: A diagram showing the distribution of sites on Dash and Chapel Becks between 2015 and 2018 and the National Fisheries Classifications for trout.

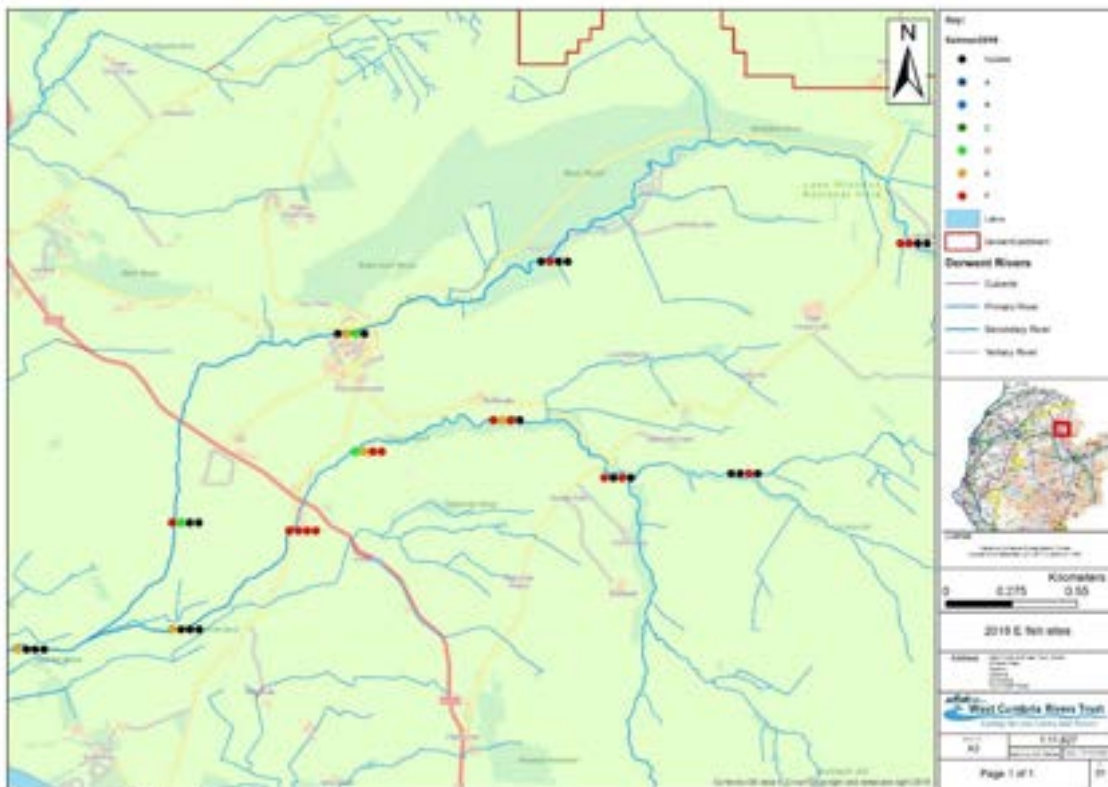


Figure 54: A diagram showing the distribution of sites on Dash and Chapel Becks between 2015 and 2018 and the National Fisheries Classifications for salmon.

5.5 River Derwent between Bassenthwaite Lake and Derwentwater

Main River

- 5.5.1 Two sites were surveyed on the main river Derwent between Bassenthwaite Lake and Derwentwater (see Figure 55 and 56 on page 59). These two sites alone contributed 8% of the total salmon fry recorded this season and both were graded A (Excellent) on the NFCS classification. No trout were recorded at either of these sites and therefore graded F.

Skiddaw Tributaries

- 5.5.2 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.
- 5.5.3 These tributaries are on the survey schedule because WCRT had identified a river restoration opportunity on them, and required baseline fish data. In 2017 several sites were conducted along their watercourses, this year (2018) because of the drought, Applethwaite Gill and Millbeck both dried up in their lower reaches downstream of the village. Access was also an issue on the lower reaches due to the construction site for the United Utilities West Cumbria Supply Project. Therefore, not the full complement of sites was conducted on these becks.
- 5.5.4 In 2017 salmon 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 E (Poor) or F (Absent). In 2018 most of these sites weren't conducted for the reasons stated above but the one site conducted on Lair Beck downstream of the A591 did have one salmon fry present. Trout are found at most the sites surveyed on the Skiddaw tributaries bar the upper one on Gale Gill, and classifications have ranged from A - D for trout fry. The four sites surveyed this year in this area had classifications of B, A, F, B for trout fry. F being the one on Gale Gill upstream of the barrier to fish passage. Trout have previously recorded in this location so it is suspected that the resident (non-migratory) trout population have been affected by drought conditions and poor water quality, or both.
- 5.5.5 Figures 55 and 56 on page 59, are maps show the distribution of survey sites on the Skiddaw tributaries and the main river Derwent between Bassenthwaite Lake and Derwentwater, for trout and salmon respectively.



Figure 55: A diagram showing the distribution of sites in the Skiddaw Tributaries area and the Main River Derwent between the two lakes, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 56: A diagram showing the distribution of sites in the Skiddaw Tributaries area and the Main River Derwent between the two lakes, between 2015 and 2018 and the National Fisheries Classifications for salmon.

Coledale Beck

- 5.5.6 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 headwater 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.
- 5.5.7 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.
- 5.5.8 Therefore, no salmon are found at the sites upstream of the village and all have a classification of F on the NFCS scheme, and this is the same for all three years Coledale Beck has been surveyed. Downstream of the village, salmon fry were recorded in 2018 and were given a classification of C (Fair). In previous years no salmon have been recorded. Trout are found upstream and downstream the village and all sites bar the one upstream of the mine, which had no trout, have classifications of D (Fair). The site downstream of the village in previous years has however been classified as E (Poor) for trout fry, this site may have had a better classification in 2018 due to fry dropping down from upstream as water levels dropped during the drought.
- 5.5.9 Figures 57 & 58 on page 63, show the distribution of sites on Coledale Beck and the NFCS classifications for four years surveying has taken place for trout and salmon respectively.

Newlands Beck

- 5.5.10 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.
- 5.5.11 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 is 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 season with little or no flow.

- 5.5.12 The data for Newlands Beck including the survey locations and the NFCS for salmon and trout fry for the last four years can be seen in Figures 59 - 64. Due to the large area Newlands Beck covers it's had to be broken down into three sections; Upper Newlands, Stair to Little Braithwaite and the third one being downstream of the A66. Figures 59, 61 and 63 show trout fry classifications and Figures 60, 62 and 64 show salmon fry classifications.
- 5.5.13 In the section named Upper Newlands, which covers the three tributaries, Newlands, Scope and Keskadale, trout fair better than salmon, which is to be expected in the upper catchment. Most sites are classified as A or B for trout fry with one C in 2018 at Chapel Bridge. Salmon fry haven't been recorded on either Keskadale Beck or Scope Beck, however they have been recorded on Newlands Beck up by the climbing hut with a classification of D in 2018 and C in 2017. The site at Chapel Bridge also has had a few salmon fry with a classification of E for salmon fry in 2018. Figures 59 and 60, on page 64 show the Upper Newlands section.
- 5.5.14 The middle section between Stair and Little Braithwaite despite having relatively poor habitat has elicited some salmon fry, with two D classifications and one E for salmon fry in 2018 and classifications of B, D, and C going downstream for trout fry. Classifications for previous years can also be seen on Figures 61 and 62 on page 65.
- 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. However, there is one site at Newlands Beck Bridge, which is very poor for fry with only a few trout fry found in 2017 giving it a classification of E. This site wasn't surveyed in 2018 as it was heavily affected by drought with little or no flow when visited, and wasn't a priority when the water levels did rise towards the end of the season. The Newlands Beck Bridge site can be seen on Figures 63 and 64 on page 66.

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 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, with classifications ranging from C to F for trout fry over the years. The upper site near Ullock Farm has more trout fry due to better habitat and has classifications ranging from B to D. In 2018 the upper site had a classification of C (Fair) for trout fry. The lower site wasn't surveyed during the 2018 survey season due to drought conditions at the start of the season and limited time at the end of the season.

5.5.18 Figures 61 and 62 on page 65, show the upper site on Pow Beck and the classifications for the four years of surveying for trout and salmon respectively. The lower site on Pow Beck is shown on Figures 63 and 64 on page 66, for trout and salmon respectively.

Chapel Beck

5.5.19 Chapel Beck is another tributary of Newlands Beck. It wasn't surveyed during the 2018 survey season as it suffered from drought at the start of the season and wasn't high on the priority list once water levels did rise. However, it is briefly mentioned in this section as sites and data from previous years can be seen on Figures 63 and 64 on page 66. No salmon are found on Chapel Beck at the site surveyed 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 been D in 2017 and E in 2016. 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.



Figure 57: A diagram showing the distribution of sites on Coledale Beck between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 58: A diagram showing the distribution of sites on Coledale Beck between 2015 and 2018 and the National Fisheries Classifications for salmon.



Figure 59: A diagram showing the distribution of sites on the Upper Newlands tributaries between 2015 and 2018, and the National Fisheries Classifications for trout.



Figure 60: A diagram showing the distribution of sites on the Upper Newlands tributaries between 2015 and 2018, and the National Fisheries Classifications for salmon.



Figure 61: A diagram showing the distribution of sites on Newlands Beck between Stair and Little Braithwaite, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 62: A diagram showing the distribution of sites on Newlands Beck between Stair and Little Braithwaite, between 2015 and 2018 and the National Fisheries Classifications for salmon.



Figure 63: A diagram showing the distribution of sites on Newlands Beck downstream of the A66, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 64: A diagram showing the distribution of sites on Newlands Beck downstream of the A66, between 2015 and 2018 and the National Fisheries Classifications for salmon.

5.6 Borrowdale

- 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, 19 sites were surveyed during the 2018 season, this is 12% of the 157 sites surveyed in 2018. These 19 sites produced 7% of the total trout fry recorded and 2% of the total salmon fry recorded during the 2018 survey season.

Upper Derwent

- 5.6.3 For the survey the River Derwent upstream of Derwentwater 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 Derwentwater. 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 Derwentwater, where it joins the lake near to Cat Gill Bay.
- 5.6.4 Five sites were 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 downstream of Rosthwaite but were not able to be surveyed due to time constraints. Sadly, any sites where salmon are found up here, have a classification of E which is 'Poor' on the NFCS scheme. In 2018, of the five survey sites, only three had salmon fry present. However, at the site named High House more salmon parr were recorded than fry which isn't reflected in the classification. Trout fry aren't found at the upstream two sites, but the downstream three sites were given classifications of D, E and C respectively going downstream, which is better than for salmon fry.
- 5.6.5 Drought had affected the Upper Derwent in Borrowdale at the start of the season, with sections bone dry, or reduced to pools or a trickle. Following reports of fish in distress, the Environment Agency rescued and relocated fish to areas where water was present (mainly around Seathwaite Farm and Seathwaite Bridge). The main reason for the river drying up in this area is 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, looking back at the past three years of survey data, salmon fry have fluctuated between E and F classifications, whereas trout fry have ranged from C to F, so are not too dissimilar to this year's results. It is 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.

Diagrams showing the NFCS for salmon and trout fry for the last four years can be found on pages 65 and 68. Figures 65 and 66, showing the area between Seathwaite and Seatoller for trout and salmon respectively, and Figures 67 and 68 showing the area around Seatoller.



Figure 65: A diagram showing the distribution of sites on the Upper Derwent and Black Syke near to Seathwaite in Borrowdale, between 2015 and 2018 and the National Fisheries Classifications for trout.

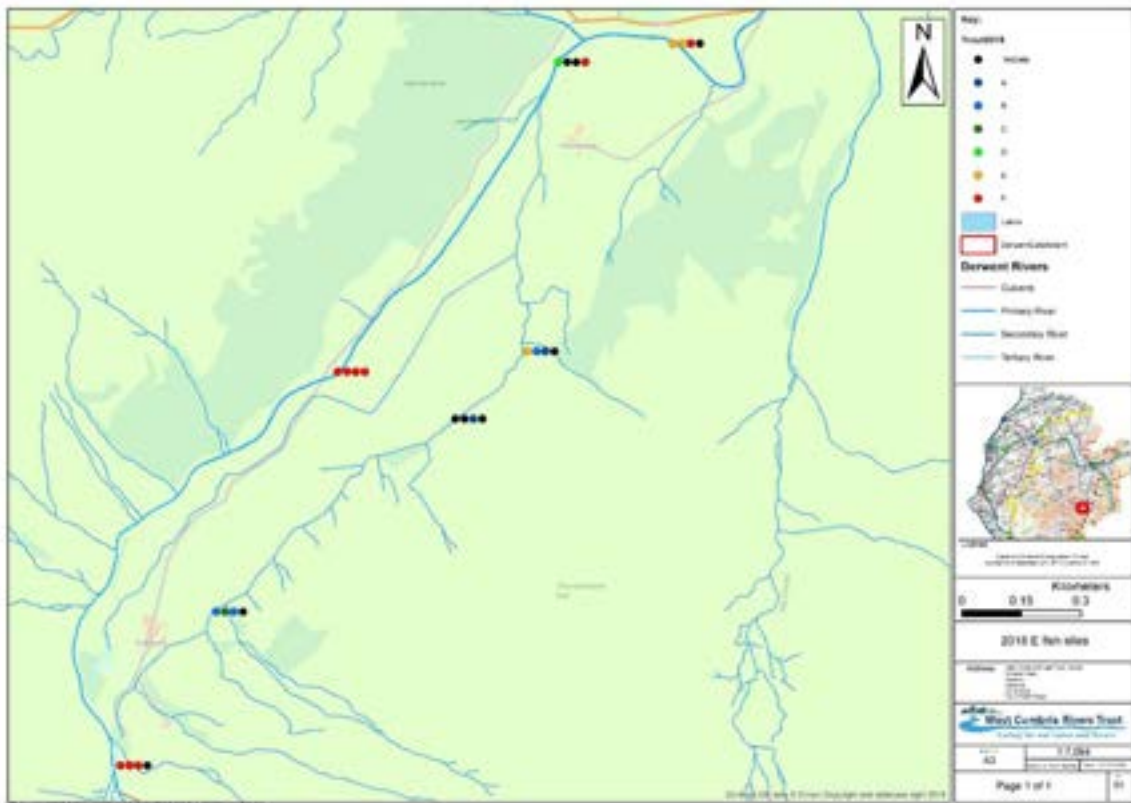


Figure 66: A diagram showing the distribution of sites on the Upper Derwent and Black Syke near to Seathwaite in Borrowdale, between 2015 and 2018 and the National Fisheries Classifications for salmon.

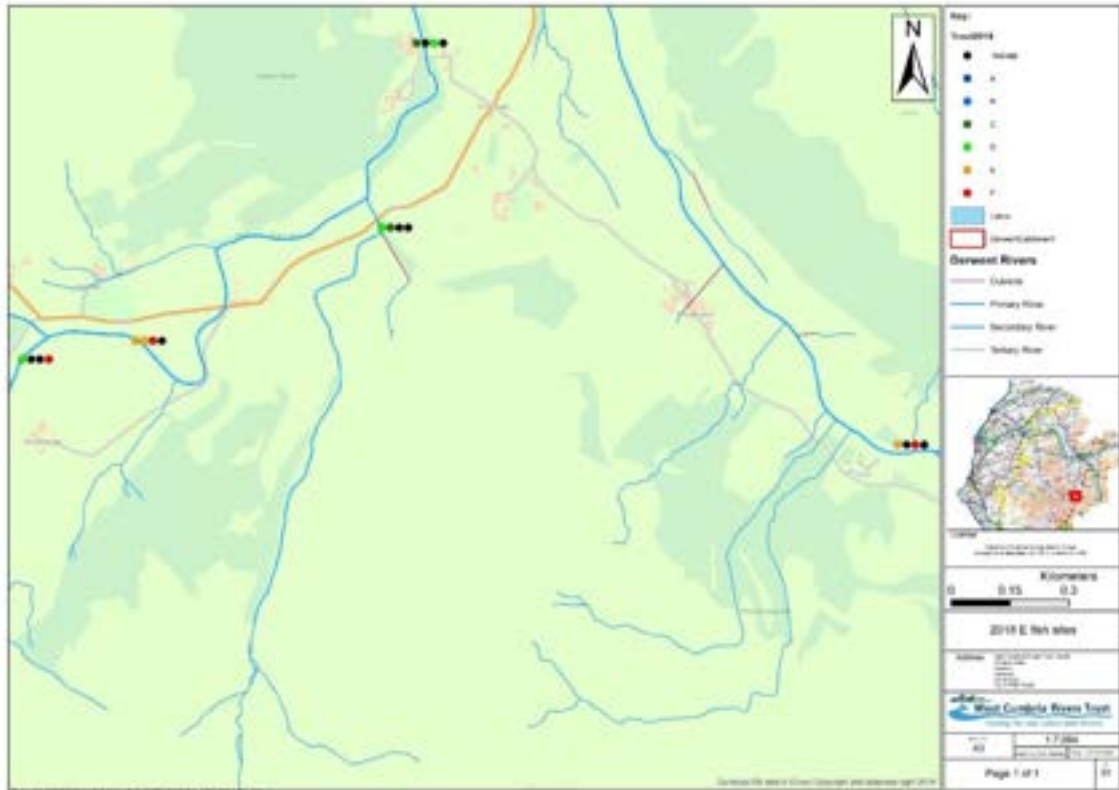


Figure 68: A diagram showing the distribution of sites on the Upper Derwent at Seatoller, Combe Gill and the upper site on Stonethwaite Beck, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 67: A diagram showing the distribution of sites on the Upper Derwent at Seatoller, Combe Gill and the upper site on Stonethwaite Beck, between 2015 and 2018 and the National Fisheries Classifications for salmon.

Black Syke

- 5.6.6 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.
- 5.6.7 Black Syke is particularly good for trout, especially trout parr. The classifications for the two sites surveyed on Black Syke in 2018 were B (Good) and E (Poor) for trout fry. However, the site that was classed as E, held good numbers of trout parr which isn't represented in this classification. Black Syke isn't as good for salmon as the habitat is more suited to trout, leading to classifications of F (no fish) and E (poor) for salmon at the two sites on Black Syke in 2018.
- 5.6.8 The location of the sites and the classifications for 2018 along with the previous year's classifications for Black Syke can be found on Figures 65 and 66, on page 68, respectively for trout and salmon.

Combe Gill

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. Only one site is conducted on Combe Gill and this is upstream of Burthwaite Bridge. Here the habitat is more suited to trout and is reflected by a classification of D (Fair) for trout fry in 2018, whereas the classification for salmon fry in 2018 was E (Poor). As well as fry recorded at this site, a large number of parr were recorded here with 13 trout parr and 1 salmon parr recorded in 2018 at this site which isn't reflected in the classifications. This site has been previously surveyed and the classifications for fry can be seen in Figures 67 and 68 on page 69, for trout and salmon respectively.

Stonethwaite Beck

- 5.6.9 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.
- 5.6.10 Only two sites are conducted on Stonethwaite Beck, one near the campsite at Stonethwaite Farm and the other in Rosthwaite behind the pub and hotels. The site at Stonethwaite Farm can be seen in Figures 67 and 68 on page 69. The figures show classifications of E for both trout fry (Figure 67) and salmon fry (Figure 68) at this site. However, despite being classed as poor for salmon fry, 25 salmon parr were recorded at this site in 2018, which isn't represented by the classification. So Stonethwaite Beck is actually pretty good for salmon.
- 5.6.11 The second site in Rosthwaite, can be seen on Figures 69 and 70 on page 71, for trout and salmon respectively. 2018 was the first time this site was surveyed. It was classified C (Fair) for both trout and salmon fry. Again, like the upstream site salmon parr were also recorded here, (9 in total), but no trout parr.

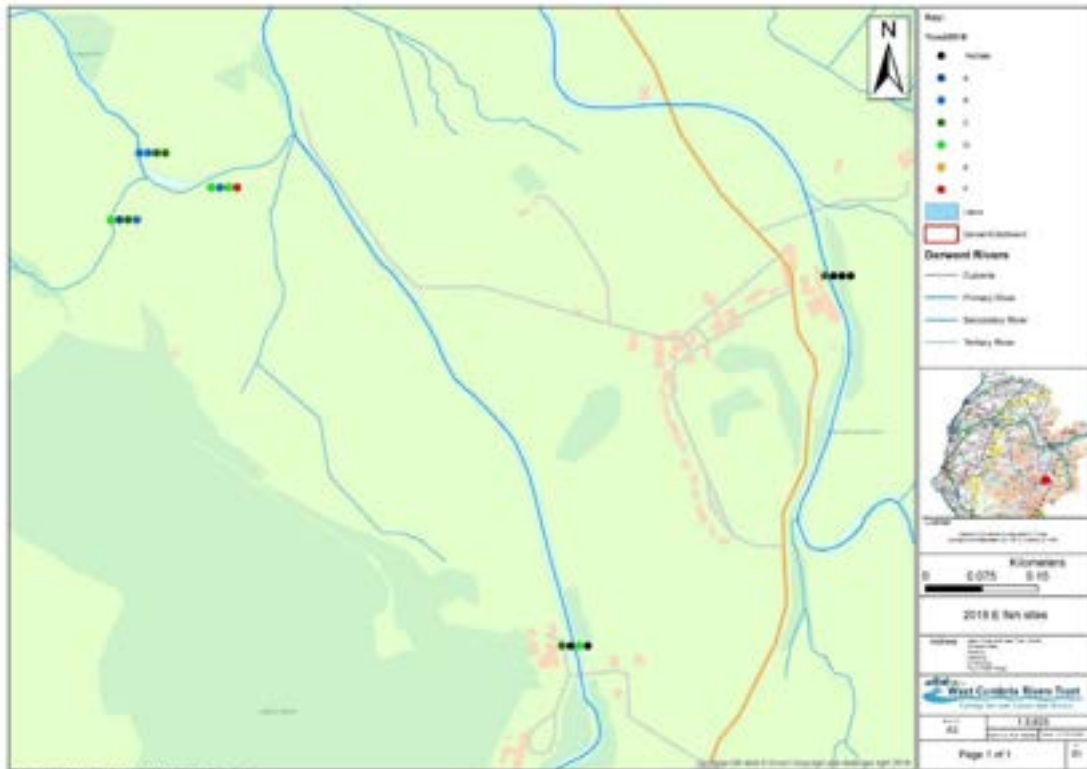


Figure 69: A diagram showing the distribution of sites in and around the village of Rosthwaite, including Tongue Gill, Stonethwaite Beck and the River Derwent, between 2015 and 2018 and the National Fisheries Classifications for trout.

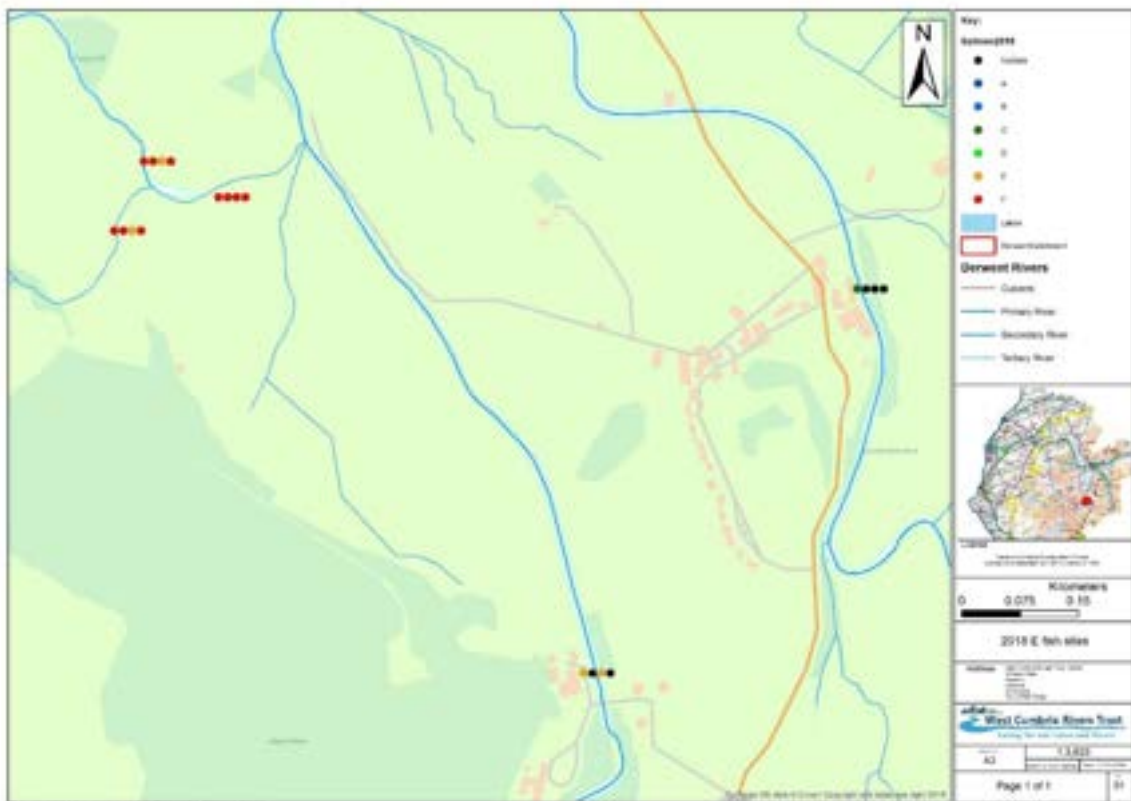


Figure 70: A diagram showing the distribution of sites in and around the village of Rosthwaite, including Tongue Gill, Stonethwaite Beck and the River Derwent, between 2015 and 2018 and the National Fisheries Classifications for salmon.

Tongue Gill

- 5.6.12 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 Scaleclose 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 and most likely did so at the start of the survey season during the drought, it is also historically dredged and in need of some dappled shade, through tree planting.
- 5.6.13 Three sites are surveyed on Tongue Gill. One upstream of the confluence with Scaleclose Gill, one on Scaleclose 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 were found on Tongue Gill during the 2018 survey season. However, in previous years (2016 survey season) some salmon fry were found at the upper two sites and given classifications of E (Poor). This can be seen on Figure 70 on page 71, which shows the classifications for salmon fry for the last four years.
- 5.6.14 Trout on the other hand fair slightly better on Tongue Gill with classifications of D, B, D in 2018. The classifications for these three sites for trout fry have fluctuated between A and D over the years with one F in 2015 at the lower site. This can be seen on Figure 69 on page 71, which shows the location of the sites and the classifications for the three sites over the last four years.

Comb Beck/ Gill

- 5.6.15 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 is usually surveyed on the programme, however this year when talking to the landowner, it was mentioned that it had been bone dry during the drought at the start of the season. Therefore, the decision was made not to survey it this year unless there was time at the end of the season, which was not the case.

Watendlath Beck

- 5.6.16 Watendlath Beck flows directly into Derwentwater. 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.
- 5.6.17 Three sites were surveyed on Watendlath Beck in 2018. 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. Despite no fry being recorded at the site downstream of the falls in 2018, 1 salmon parr was recorded here, which isn't reflected in the classification. Figure 72 on page 74, shows the location of the sites on Watendlath Beck and the classifications for salmon fry for the last few years. Trout on the other hand are recorded upstream and downstream of the falls, with classifications of E, D, E going downstream. Numbers aren't particularly high but they are maintaining a presence. Some trout parr were also recorded at the downstream two sites. Figure 71 on page 74, shows the location of the sites on Watendlath Beck and the classifications for trout fry for the sites over the last few years. The middle site had not previously been surveyed before 2018.

Brockle Beck

- 5.6.18 Brockle Beck is another tributary that flows directly into Derwentwater. 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.
- 5.6.19 No salmon fry have ever been found on Brockle Beck, however, at the middle site near to Springs Farm, two salmon parr were recorded here along with three trout parr in 2018. This site also had a good classification of B for trout fry. The site in Springs Wood also had a large amount of trout parr, with 8 recorded during the 2018 season, and had a classification of C for trout fry. The most downstream site, surveyed on Brockle Beck in 2018 had no trout or salmon fry, however one trout parr was recorded here.
- 5.6.20 This tributary suffers from intermittent farm pollution, indeed whilst surveying the lower site, the water turned very brown.
- 5.6.21 Figures 73 and 74 on page 75, show the locations of the sites on Brockle Beck and the classifications for the sites over the last four years for trout and salmon respectively.



Figure 71: A diagram showing the distribution of sites on the Derwentwater tributaries including Comb Beck and Watendlath Beck, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 72: A diagram showing the distribution of sites on the Derwentwater tributaries including Comb Beck and Watendlath Beck, between 2015 and 2018 and the National Fisheries Classifications for salmon.

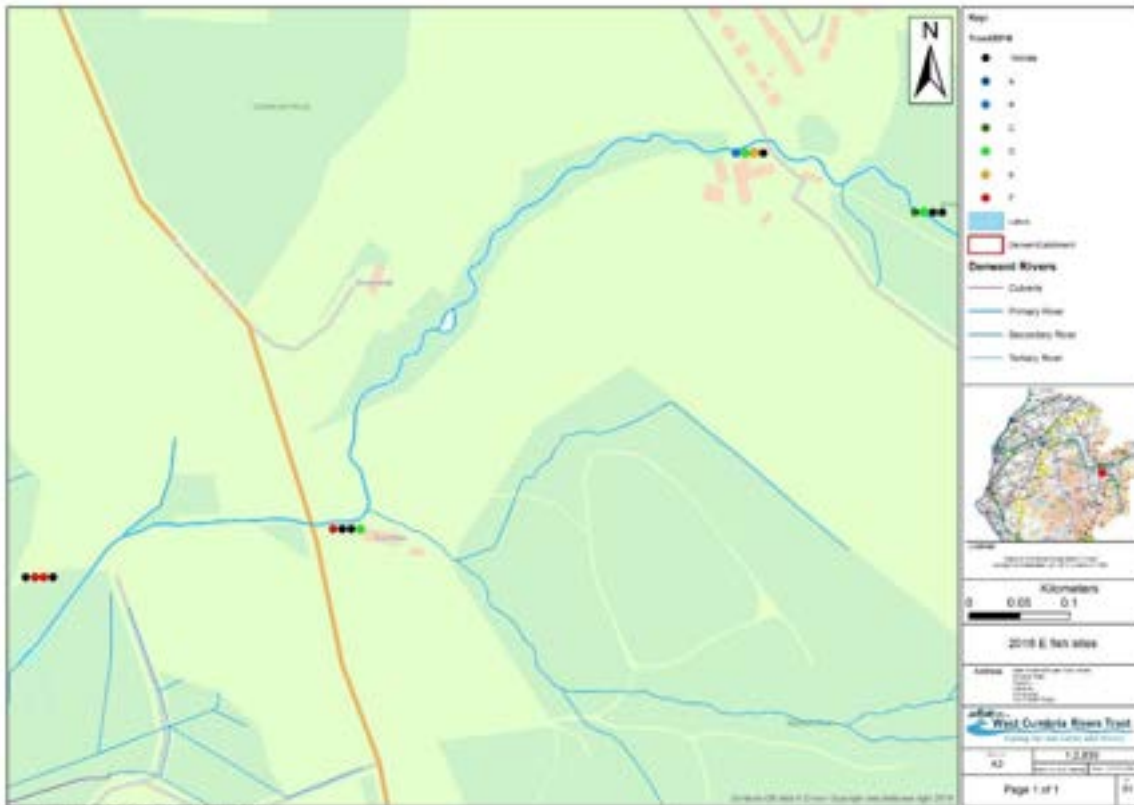


Figure 73: A diagram showing the distribution of site on Brockle Beck between 2015 and 2018 and the National Fisheries Classifications for trout.

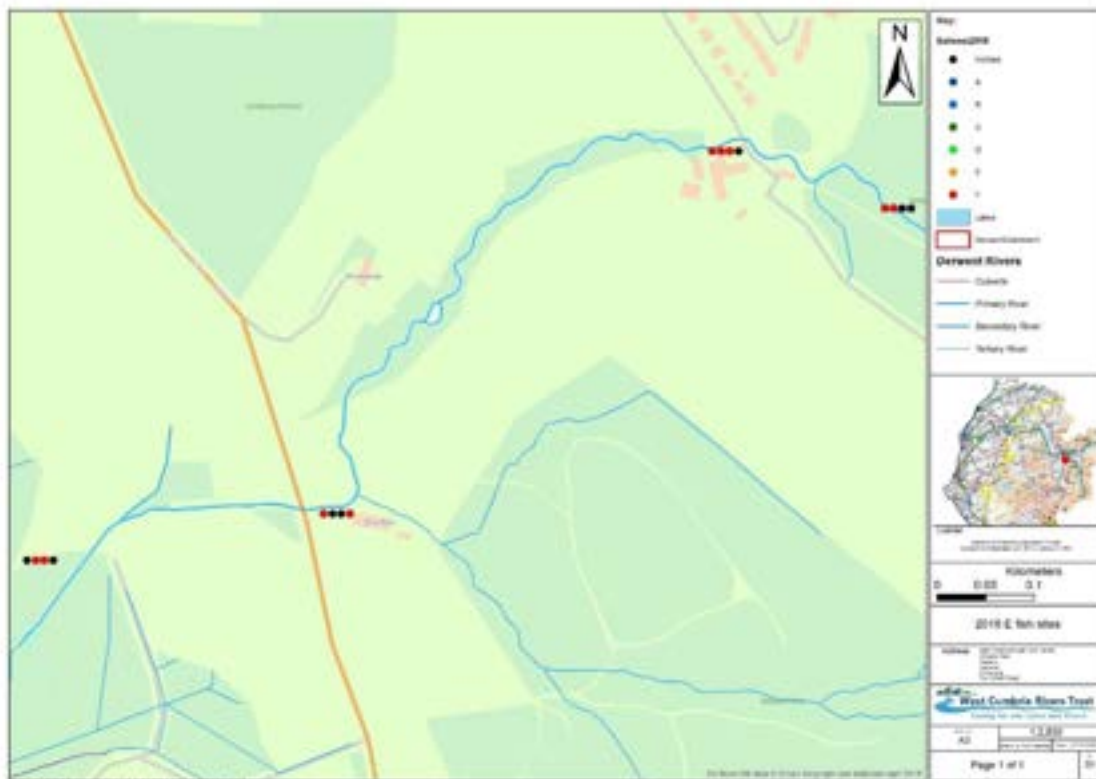


Figure 74: A diagram showing the distribution of sites on Brockle Beck between 2015 and 2018 and the National Fisheries Classifications for salmon.

5.7 Greta

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 31 sites were surveyed within the Greta catchment, which is 20% of the total number of sites surveyed. These 31 sites produced 14% of the total trout fry recorded and 36% of the total salmon fry recorded.

Main River

5.7.3 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.

5.7.4 Surveys were undertaken at two sites on the main river Greta in 2018. 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. Both were scored E (Poor) for trout fry, but were scored C (Fair) for salmon fry. Neither site had been surveyed before, so 2018 was the first for these sites on the main river Greta. Both sites a reasonable amount of salmon parr were also recorded which isn't reflected in the classifications. At the Fitz Park site, 5 salmon parr were recorded, and the site near to the Glenderaterra confluence, 10 salmon parr were recorded.

5.7.5 Figures 75 and 76 on page 79, show the location of the site within Fitz Park, and Figures 77 and 78 on page 80, show the location of the other site in relation to the Glenderaterra.

Glenderaterra

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 Four sites are usually surveyed on the Glenderaterra and one on Whit Beck. The day the Glenderaterra was being surveyed, Whit Beck was reduced to a trickle and it was deemed not suitable to survey; however, the Glenderaterra itself had more water in it and those four sites were surveyed. Trout fry were recorded at all four sites in 2018 and had classifications of; B, C, B, E going downstream. The downstream site being poor for trout probably because the salmon out-compete them here. Good numbers of trout parr were also recorded at all four sites which is not shown in the classifications. The only year trout did poorly on this watercourse was 2016, which was post Storm Desmond. Figure 77 shows the location of the sites on the Glenderaterra and the classifications for trout fry for the last four years.

5.7.8 The Glenderaterra, throughout the four years of surveying, has never been very good for salmon fry, with previous classifications of E and F. This is because of mobile substrates and regular flood events which affect spawning success by washing the redds out. However, in 2018, the four sites were classified as the following going downstream: D, D, C, C. This means some adult fish made it up stream and had some spawning success. At the downstream three sites, salmon parr were also recorded, meaning at least some fry have survived from the previous years. Figure 78 shows the location of the sites on the Glenderaterra and the classifications for salmon fry for the last four years.

Naddle Beck

- 5.7.9 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.
- 5.7.10 Four sites were surveyed on Naddle Beck in 2018. As is expected, the upstream parts of Naddle Beck tend to feature more trout fry than the downstream parts, this can be seen from the classifications getting poorer as they go downstream; at the furthestmost upstream two sites, both has classifications of B (Good), the two downstream sites had classifications of E (Poor) and F (Absent). Despite the most downstream site having no trout fry, some trout parr were recorded here, the other three sites also had some trout parr present.
- 5.7.11 Salmon fry were recorded at all four sites, with the classifications being; B, D, C, B going downstream. The site classed as D, saw less salmon fry recorded because the habitat was more suited to trout fry and trout parr. The furthestmost downstream site, classed as B for salmon fry, also had 12 salmon parr recorded which isn't shown in this classification. Salmon fry have varied at the sites surveyed over the last four years with classifications ranging from A to F.
- 5.7.12 Because of the way the Naddle flows the diagrams have been split into upper and lower along with St John's Beck. Figures 79 and 80 on page 81, show the upper sections of the Naddle and the location of the upper two sites surveyed in 2018 along with some other sites surveyed in previous years the classifications for the last four years. Figures 81 and 82 on page 82, show the lower sections of the Naddle and the location of the lower two sites, along with some others from previous years and the classifications for the last four years.

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.
- 5.7.14 St John's Beck is the best spawning tributary in the catchment for salmon after the main river. Three sites are surveyed on St John's Beck every year, which in 2018 was just 2% of the total sites surveyed but produced 14% of the total salmon fry recorded. Trout fair less well on St John's Beck because they are out-competed by the salmon, and the three sites produced just 0.3 % of the total trout fry recorded in 2018. One of the factors positively affecting 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.
- 5.7.15 Because salmon fry thrive in this beck all three sites were given a classification of A (Excellent) in 2018, but in previous years have varied between B to D. Trout fry in 2018 were given classifications of D, E, E going downstream and in previous years has varied between B to E. All the classifications and locations of the survey sites can be seen on Figures 79 to 82. The upper section of St John's Beck on Figures 79 and 80 on page 81, the lower sections on Figures 81 to 82 on page 82.

5.7.16 Fun Fact: The middle site at Wanthwaite Bridge, on St John's Beck was a record-breaking site in 2018. The most number of salmonids ever recorded in a 5-minute survey by WCRT was recorded here. In total: 344 salmon (6 parr, 338 fry) and 1 trout fry, as well as 1 eel, 2 stone loach, 2 minnows, 3 sticklebacks.



Figure 75: A diagram showing the distribution of sites on the River Greta between 2015 and 2018 and the National Fisheries Classifications for trout.

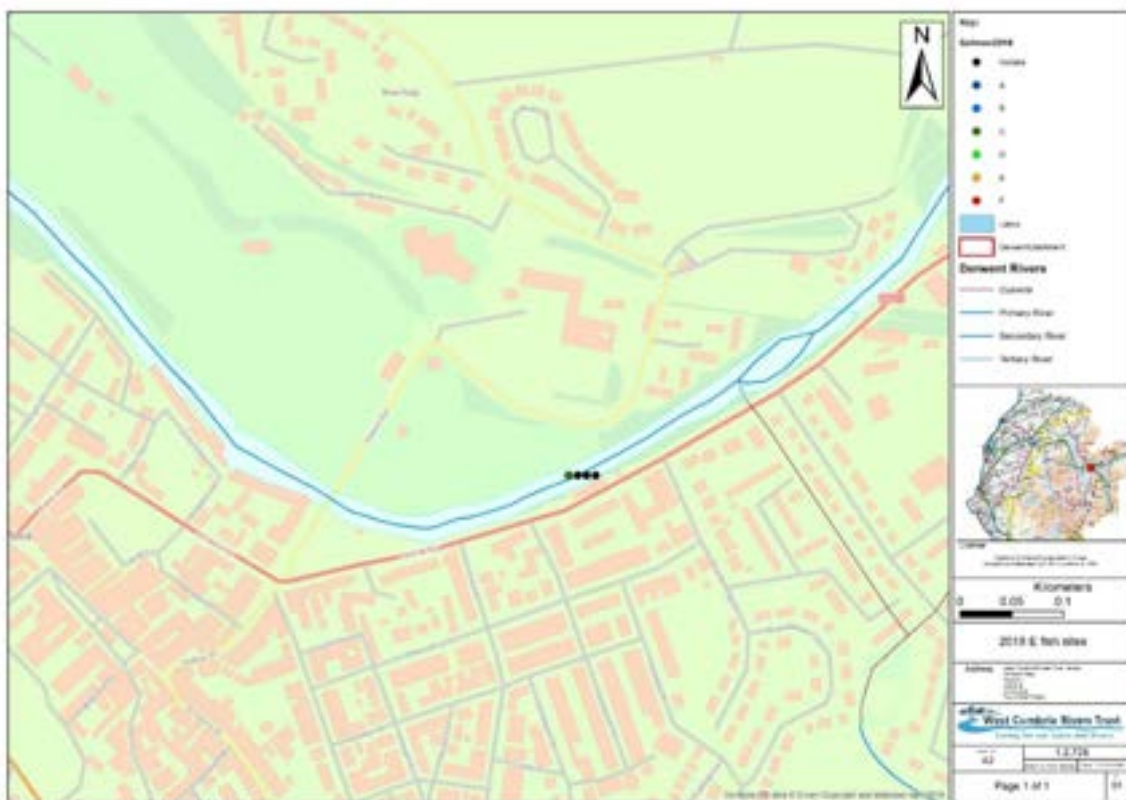


Figure 76: A diagram showing the distribution of sites on the River Greta between 2015 and 2018 and the National Fisheries Classifications for salmon.

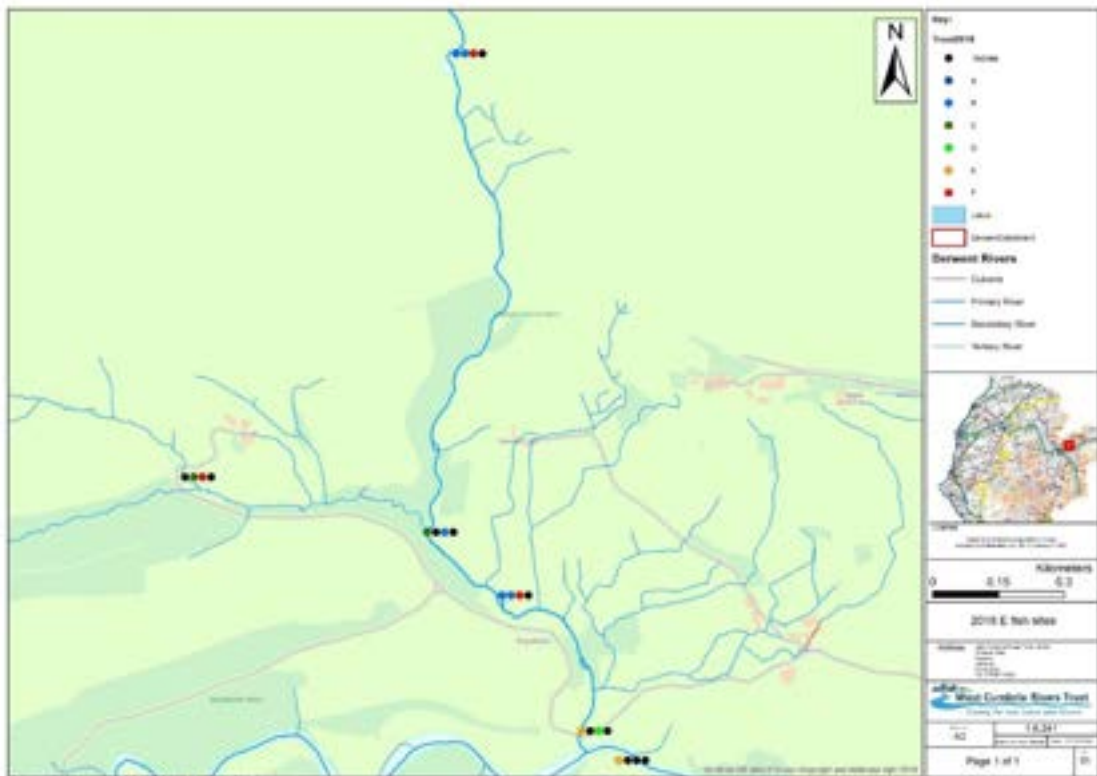


Figure 77: A diagram showing the distribution of sites on the Glenderaterra and one site on the River Greta, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 78: A diagram showing the distribution of sites on the Glenderaterra and one site on the River Greta, between 2015 and 2018 and the National Fisheries Classifications for salmon.



Figure 79: A diagram showing the distribution of sites on the upper sections of Naddle Beck and St John's Beck, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 80: A diagram showing the distribution of sites on the upper sections of Naddle Beck and St John's Beck, between 2015 and 2018 and the National Fisheries Classifications for salmon.

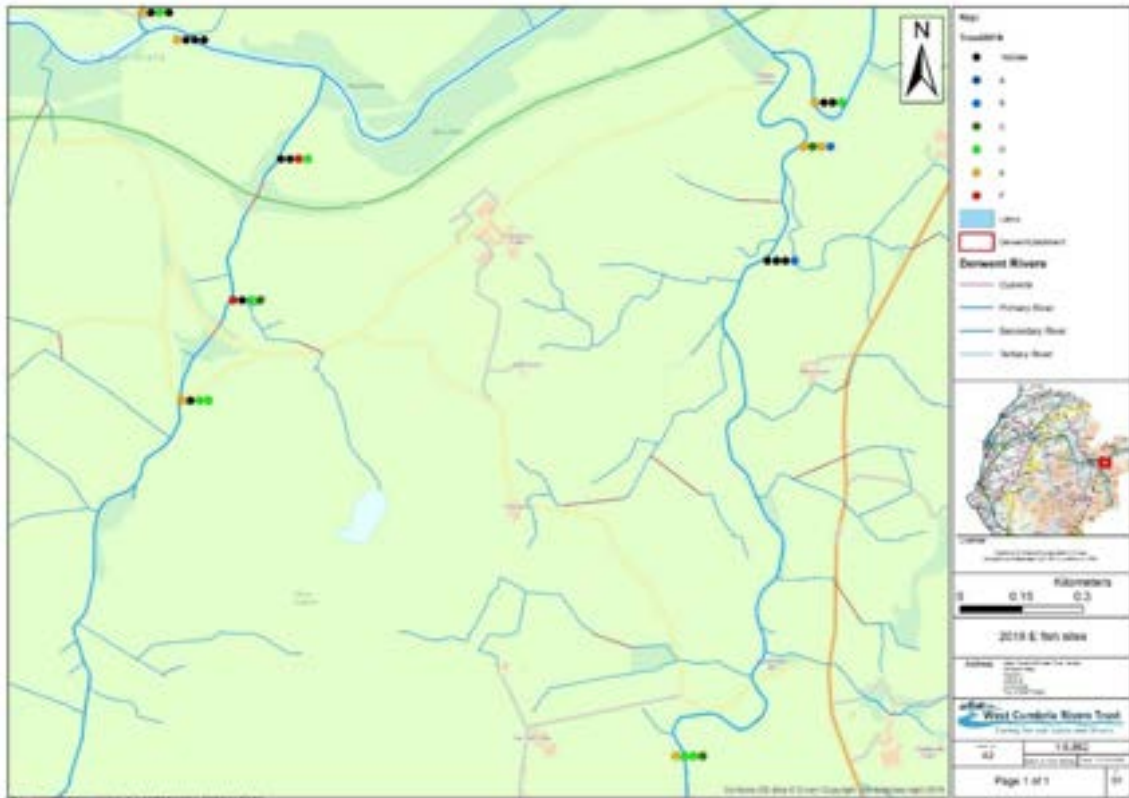


Figure 81: A diagram showing the distribution of sites on the lower sections of Naddle Beck and St John's Beck, and one site on the Glenderamackin, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 82: A diagram showing the distribution of sites on the lower sections of Naddle Beck and St John's Beck, and one site on the Glenderamackin, between 2015 and 2018 and the National Fisheries Classifications for salmon.

Mosedale Beck

- 5.7.17 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.
- 5.7.18 Four sites are usually surveyed on Mosedale Beck, in 2018 only three of these sites were conducted, because landowner permission could not be obtained at the fourth. The three sites got classifications of: C, E, D going downstream, for trout fry. Several trout parr were also recorded at the upper two sites. Salmon fry are not present at the upper two sites due to the nature of the terrain, but are present at the lower site which has a classification of C (Fair). Two salmon parr were also recorded at the lower site.
- 5.7.19 Over the year's salmon haven't maintained a presence on Mosedale Beck so it was nice to see them returning to the bottom of this watercourse. Trout on the other hand have fluctuated between presence and absence, there was a notable absence post Storm Desmond. This can be seen in Figure 83 on page 85, which shows the location of the sites on Mosedale Beck and the classifications for the sites for the last four years for trout fry. Figure 84 also on page 85, shows the location of the sites and the classifications for the salmon fry for the last four years.

Glenderamackin

- 5.7.20 The 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.
- 5.7.21 Eight sites in total were conducted on the Glenderamackin in the 2018 survey season. For the eight sites the classifications for trout fry ranged from B to E, whereas the salmon ranged from A to F. Like many watercourses, salmon weren't found at the top two sites, but were found in the village of Mungrisdale and hovered around the 'Fair' classifications going downstream, and the best classification of A was the site just upstream of the confluence with St John's Beck. Whereas trout stayed around the 'Good' classifications in the upper reaches and less trout were recorded the further downstream.
- 5.7.22 Because the Glenderamackin covers such a large area the sites can be found on three different maps. The very bottom site, just upstream of the confluence with St John's Beck can be found on Figures 81 and 82 on page 82. The middle two sites can be found along with the Mosedale sites on Figures 83 and 84 on page 85. The five sites at the top of the catchment can be found on Figures 85 and 86 on page 86.

Barrow Beck

- 5.7.23 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.

- 5.7.24 Barrow Beck is on the survey programme because some work has been undertaken to improve the habitat and also some further projects are in the pipeline, and therefore the surveys are acting as monitoring for the improvement projects.
- 5.7.25 Trout fry were only found at the upper two sites out of the four surveyed on Barrow Beck, and therefore the classifications going upstream were: F, F, E, D. Salmon fry were only found at the bottom site (along with one salmon parr) with a classification of E (Poor). Only the second site, were no salmonids recorded. More sites have been surveyed on Barrow Beck in previous years to get a baseline data set, but as the number of sites to survey in a season has increased the need for so many on Barrow Beck, has decreased, to allow more sites across the catchment to be surveyed. Figures 85 and 86 on page 86, show all the sites that have been surveyed on Barrow Beck over the last four years and the classifications for each for trout and salmon respectively.

Trout Beck

- 5.7.26 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.
- 5.7.27 Three sites were surveyed on Trout Beck during the 2018 survey season. A fourth was attempted but the equipment broke halfway through and had to be abandoned, however at this fourth site, before the kit broke, two bullheads (*Cottus gobio*) were recorded, which have never been recorded by the survey team in the Derwent catchment before.
- 5.7.28 As the name suggests trout are found on this watercourse, and the three sites had classifications of D, B, B going upstream. Several trout parr were also recorded at the three sites. Salmon are also found here, but not in great numbers, with classifications of E, D, E going upstream. In previous years' salmon fry have only been found at the Wolt Bridge site, the most downstream site. Also in previous years no salmonids (trout or salmon) have been found upstream of the village of Troutbeck.
- 5.7.29 The location of the sites and the classifications for Trout Beck can be found on Figures 87 and 88 on page 87 for trout and salmon respectively. The Wolt Bridge site can be seen on Figures 83 and 84 on page 85.

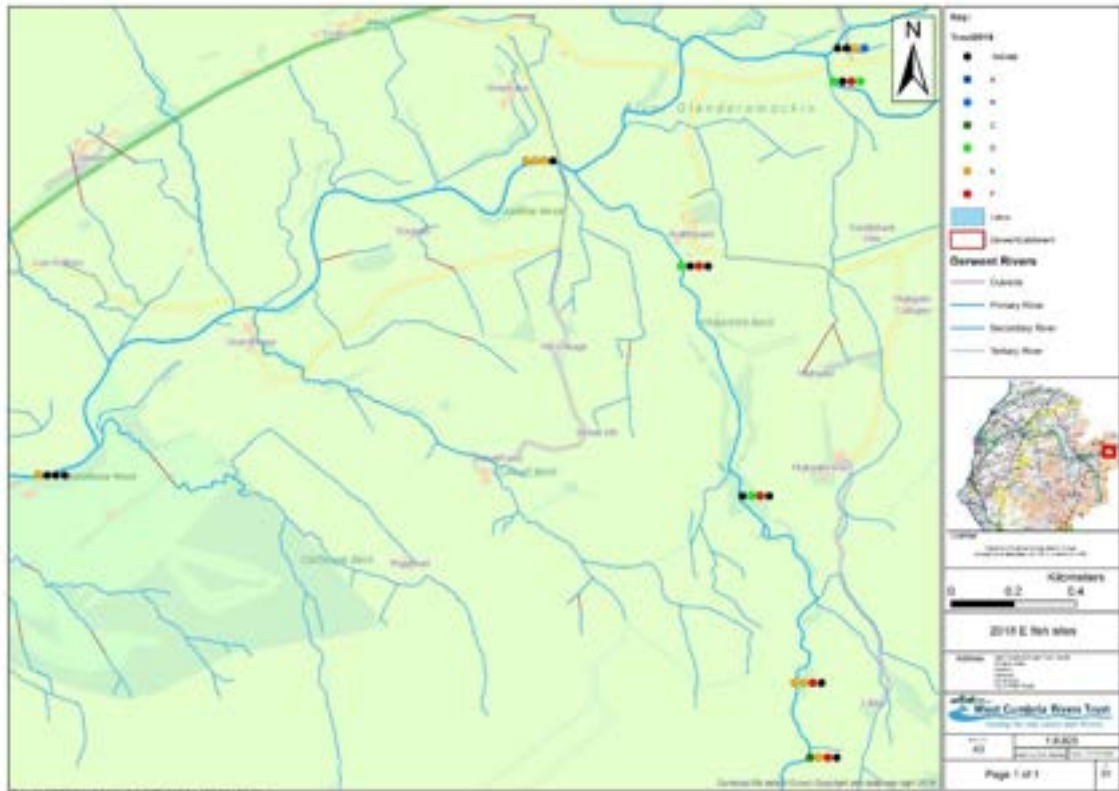


Figure 83: A diagram showing the distribution of sites on Mosedale Beck and a few on the Glenderamackin, between 2015 and 2018 and the National Fisheries Classifications for trout.



Figure 84: A diagram showing the distribution of sites on Mosedale Beck and a few on the Glenderamackin, between 2015 and 2018 and the National Fisheries Classifications for salmon.

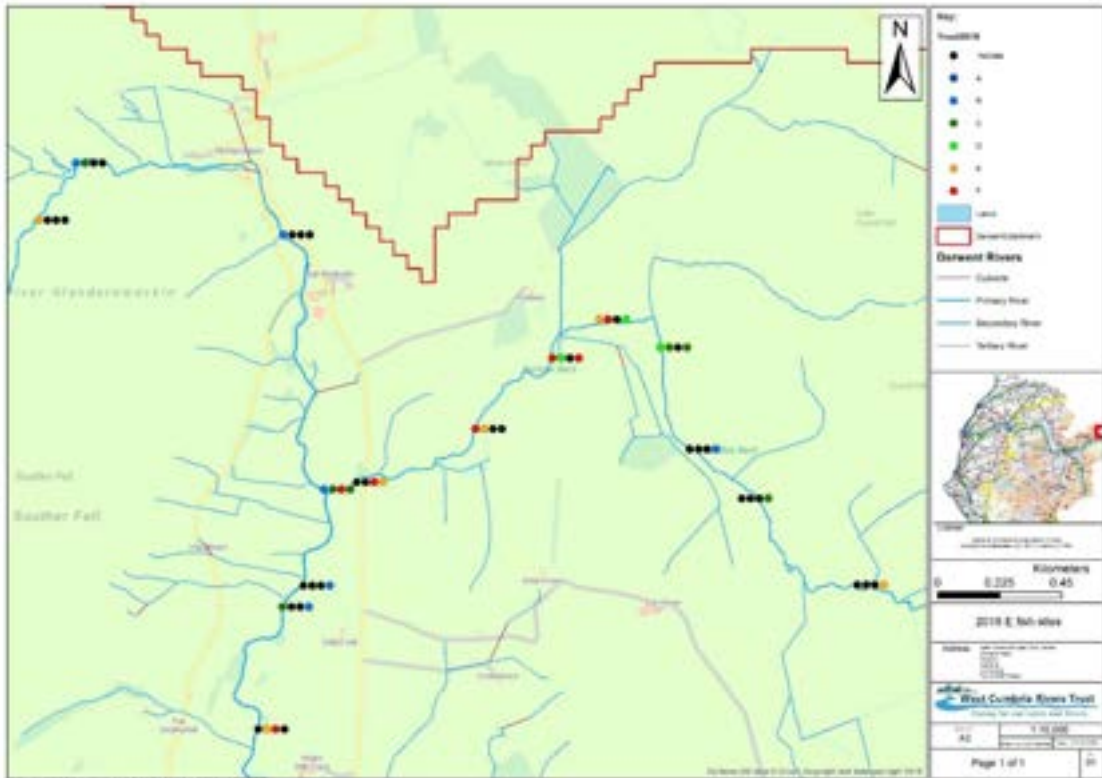


Figure 85: A diagram showing the distribution of sites on the upper section of the Glenderamackin and a tributary called Barrow Beck, between 2015 and 2018 and the National Fisheries Classifications for trout.

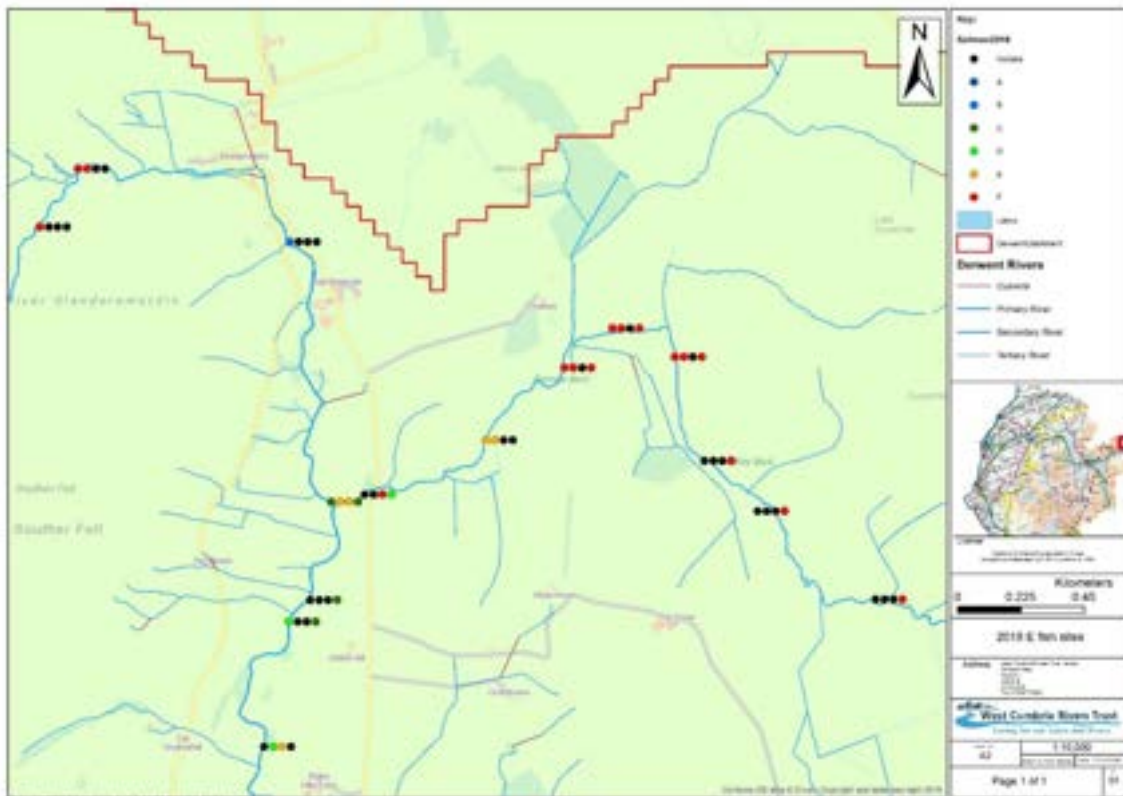


Figure 86: A diagram showing the distribution of sites on the upper section of the Glenderamackin and a tributary called Barrow Beck, between 2015 and 2018 and the National Fisheries Classifications for salmon.

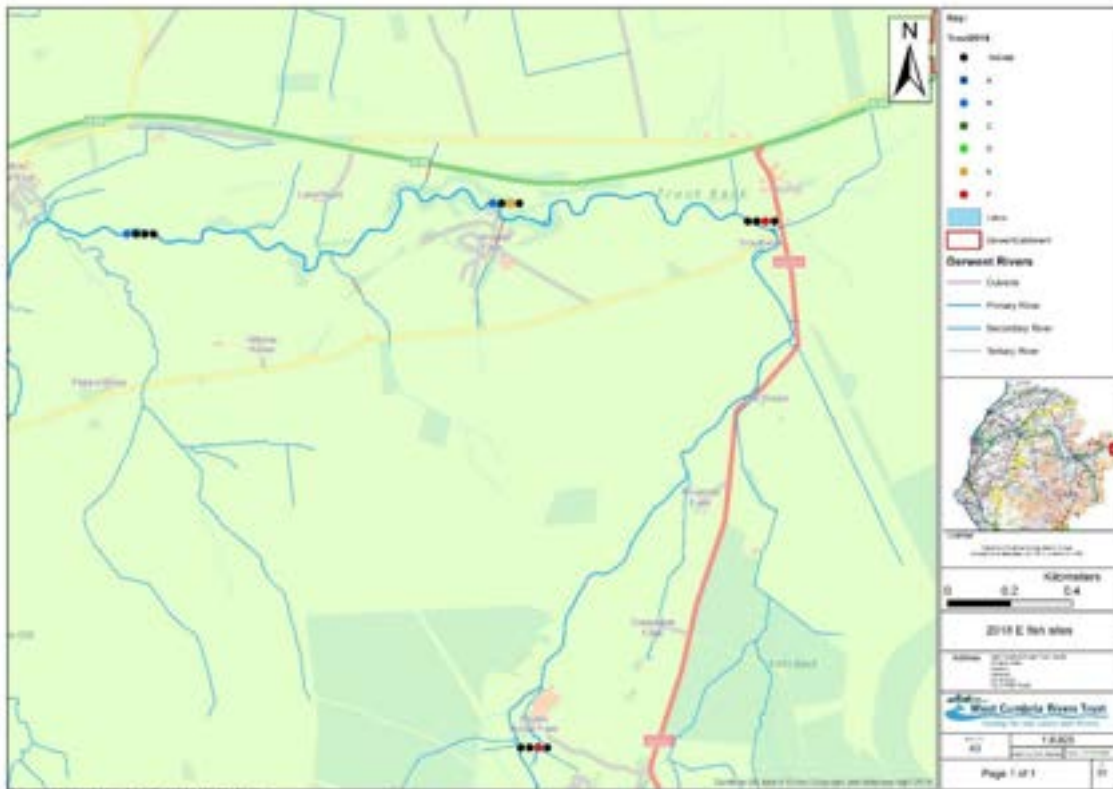


Figure 87: A diagram showing the distribution of sites on Trout Beck, between 2015 and 2018 and the National Fisheries Classifications for trout.

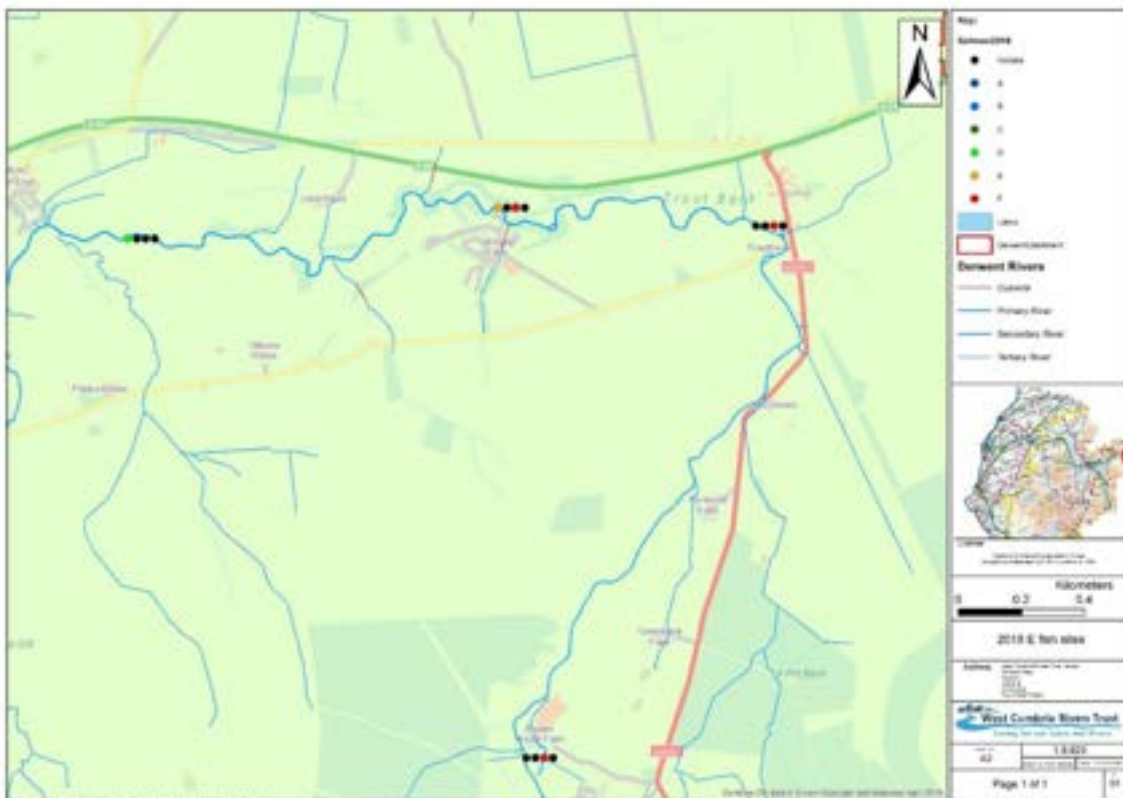


Figure 88: A diagram showing the distribution of sites on Trout Beck, between 2015 and 2018 and the National Fisheries Classifications for salmon.

6 Habitat Survey Results

6.1 Individual Site Habitat Scores

- 6.1.1 Table 9 summarises the habitat categories for the 157 sites and how many were classified into each category out of a total of 157 sites. A more detailed table of the habitat data can be found in Appendix C on page 115, this includes; the classifications for each of the 157 sites, a reference photo and potential opportunities for improvement works.

<i>Category</i>	<i>Number of sites</i>	<i>Percentage of total number of sites.</i>
Maintain	73	46.5%
Repair	76	48.4%
Restore	8	5.1%

Table 9: Summary of the individual sites habitat classifications.

- 6.1.2 Figure 89, on page 89 shows the site specific habitat scores. It should be noted that these scores are only in relation to the specific site (an area of between 10-30m in length).

6.2 Tributary Habitat Scores

- 6.2.1 The overall watercourse or tributary classifications can be seen in Figure 90 on page 90. More detail about the individual characteristics of each tributary/ watercourse is shown in Appendix D, on page 164. This includes some of the issues encountered, suggests opportunities for habitat improvement works and also has an extra column this year to cover the effects the drought had on each watercourse.
- 6.2.2 Please also note that as well as the data being slightly skewed or biased due to upscaling from a small survey area to a larger catchment area, some of the tributary habitat classifications have changed from previous years due to changes in the number of sites surveyed along each watercourse.

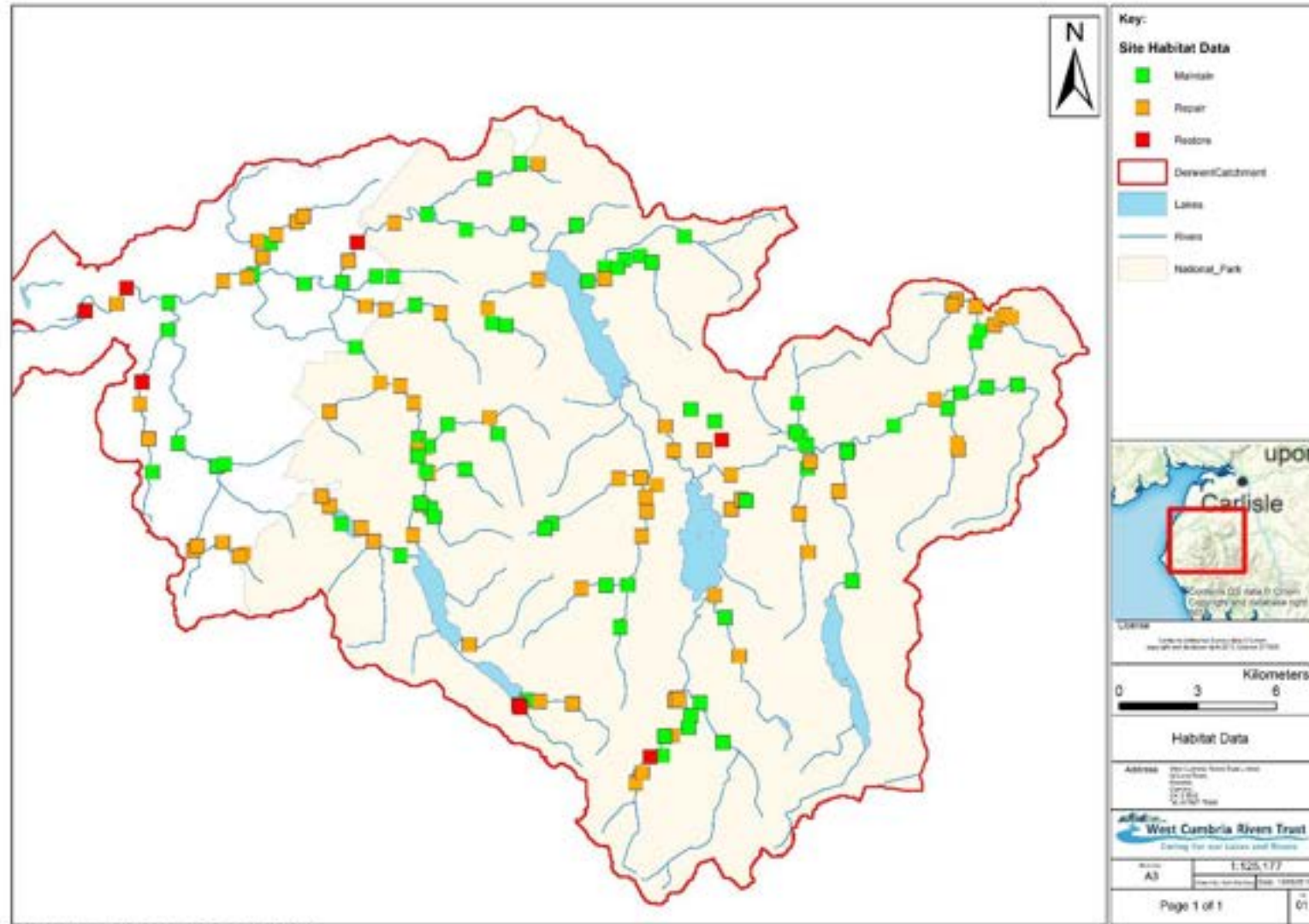


Figure 89: A diagram showing the distribution of sites across the River Derwent catchment and the corresponding habitat classifications they have been assigned, from Maintain, Repair and Restore.

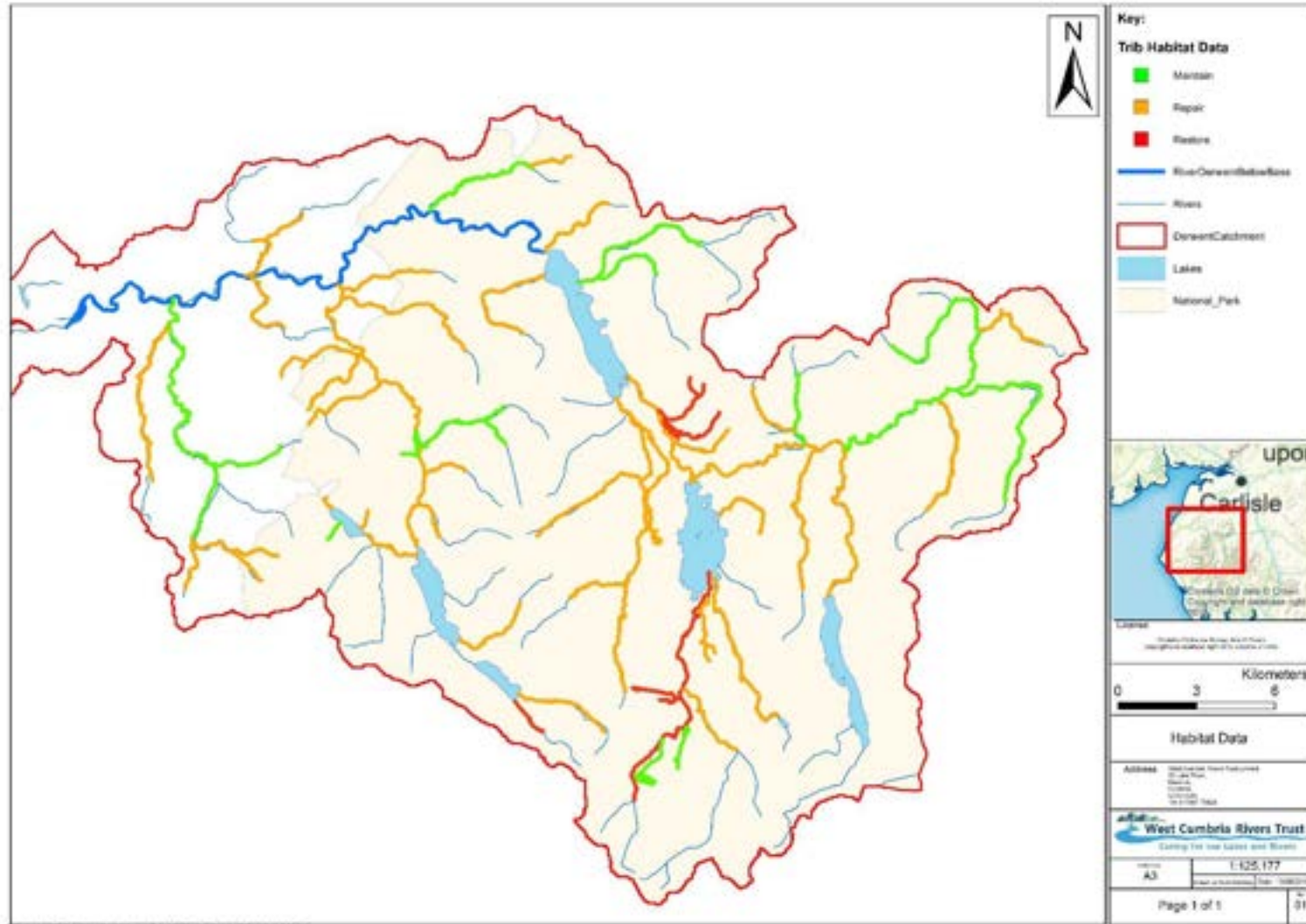


Figure 90: A diagram showing the overall watercourse habitat classifications or either Maintain, Repair or Restore. The Main River Derwent downstream of Bassenthwaite Lake is Blue because an overall score could not be reached due to too many variables between the sites.

6.3 Invasive Non Native Species (INNS)

- 6.3.1 Another thing that is noted whilst surveying is the location of any Invasive Non Native Species (INNS) such as Japanese knotweed, Himalayan balsam and the American signal crayfish, which are some of the more prevalent invasive species within the Derwent catchment.
- 6.3.2 For the first time in the four years of conducting these surveys, an American signal crayfish was caught whilst conducting a 5-minute electrofishing survey. It was caught on a tributary where they are known to reside and an extensive programme of trapping and hand searches to try and control the spread and eradicate them is currently being undertaken by WCRT and partners such as the Environment Agency and Natural England.
- 6.3.3 The other species to note of importance due to its prevalence, is Himalayan balsam. It is a pink flowering plant with shallow roots that does particularly well along river banks. Due to the drought and low flows, it popped up in a lot of places this year, and has started to colonise gravel bars. Figure 91 on page 92 and Figure 92 on page 93, show the distribution of Himalayan balsam across the Derwent catchment during the 2018 and 2017 seasons respectively. It can be seen that between the two years there was an increase in the amount of balsam recorded, with 60 sites out of 157 were recorded as having Himalayan Balsam present (38%) in 2018 compared to 23 sites out of 136 sites (17%) in 2017. In the 2017 surveys most of the balsam recorded was in the lower parts of the catchment.

6.4 Substrate

- 6.4.1 Substrate is of key interest because this is a key habitat factor for salmonids. Within the habitat survey, the percentage of the different river substrates is recorded, using the categories: bedrock, boulders, cobbles, gravel, sand and silt. Figure 93 on page 94, shows the survey sites and a stacked bar chart for each site, which has bands that are proportional to the different percentages of the different substrates found at each site. Gravel is the substrate required for successful salmonid spawning, whereas silt usually prevents successful salmonid reproduction, reducing the amount of oxygen in the bed of the river. Bedrock is also not particularly good for fish as it has few places to hide and shelter and adult fish are less likely to spawn where lots of bedrock is present. Sites with lots of bedrock tend to be higher up the catchments in the headwaters, and fish numbers tend to reflect this change in substrate. Overall, the results show that gravel and cobble areas tend to dominate throughout the sites surveyed, but this may reflect the choice of site, as riffles are surveyed over pools, as this is where you tend to find fry, as the parr and adult fish dominate in the pools.

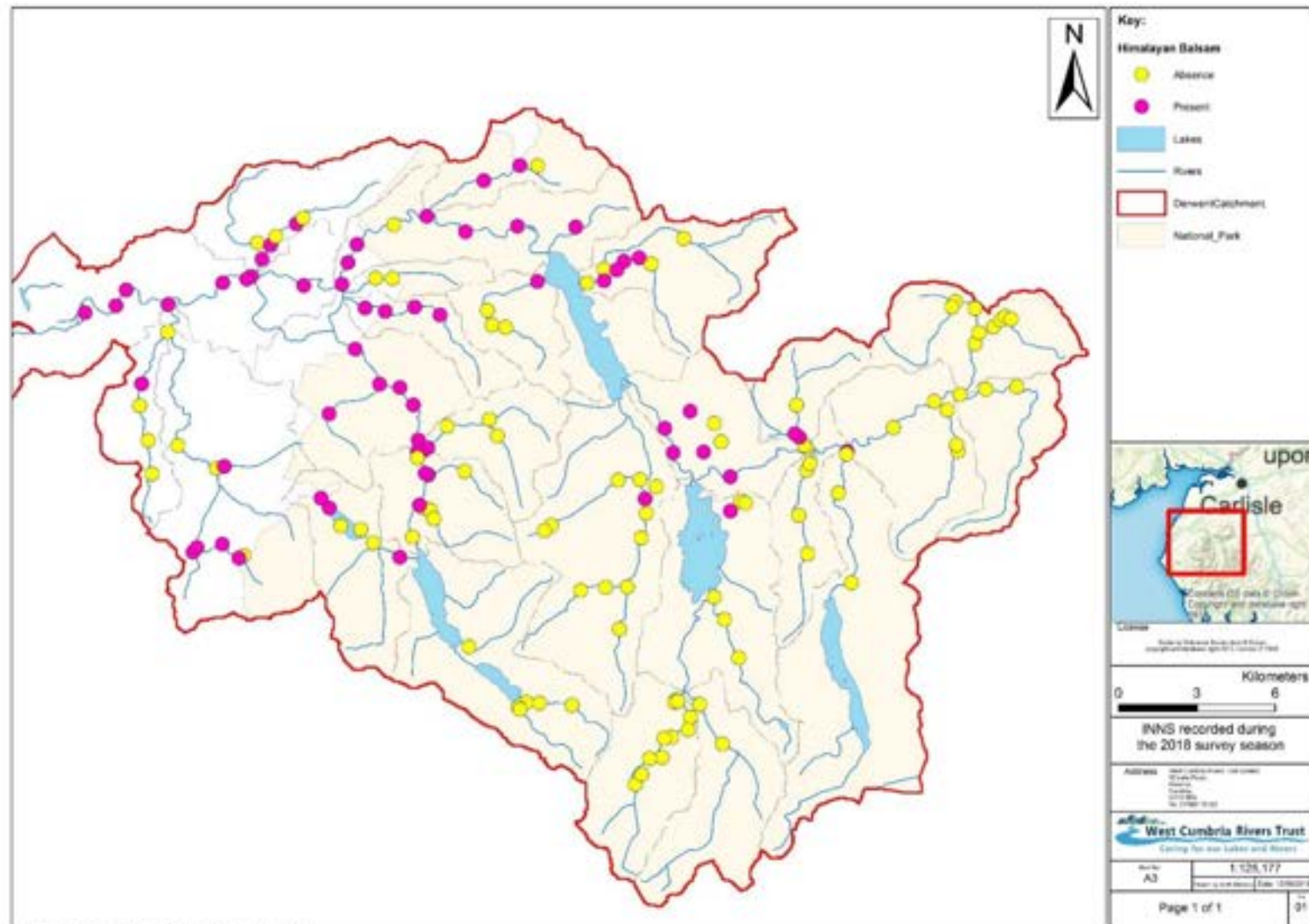


Figure 91: A map of the Derwent catchment showing the locations Himalayan balsam was recorded.

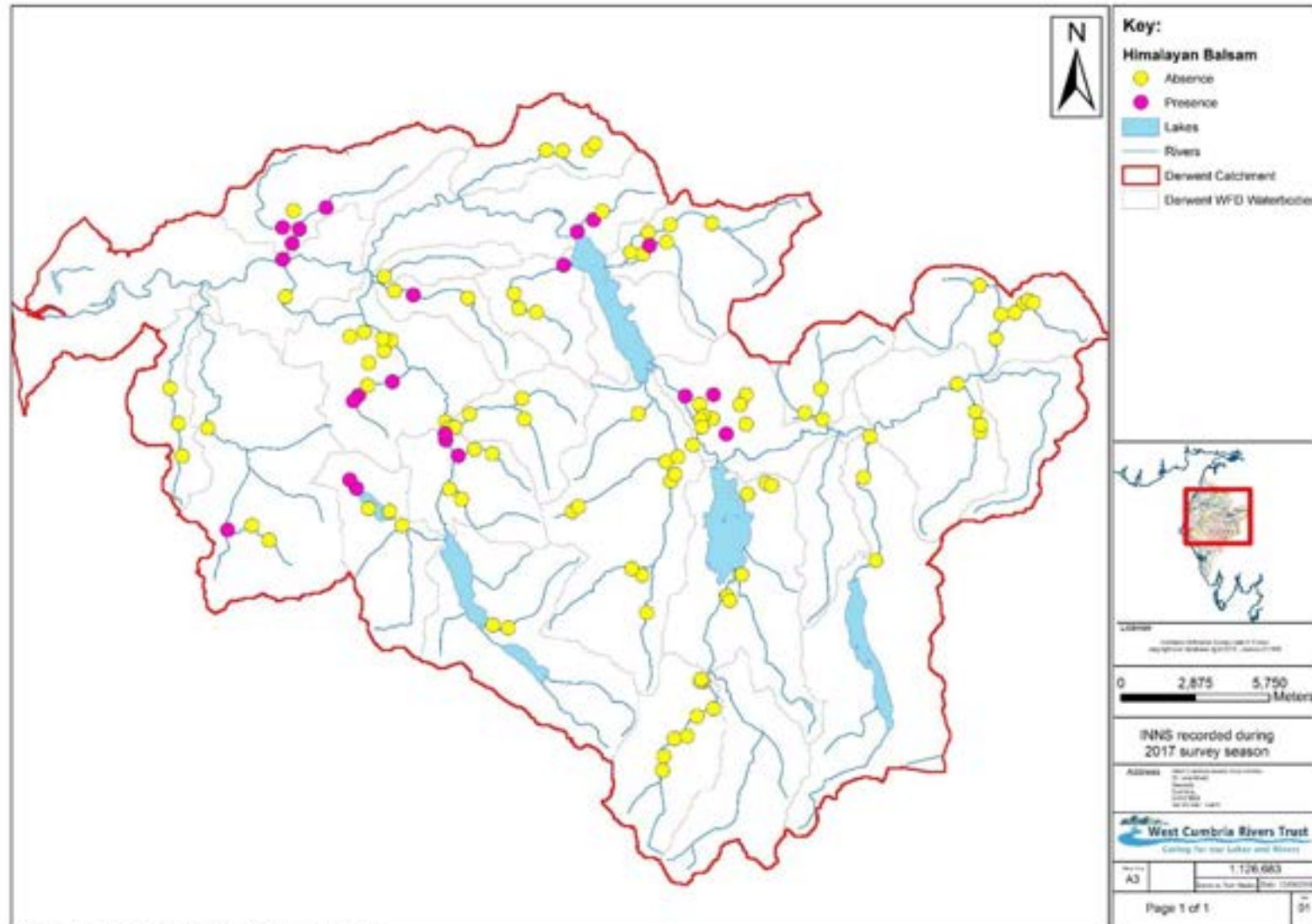


Figure 92: A diagram showing the distribution of Himalayan Balsam recorded during the 2017 survey season.

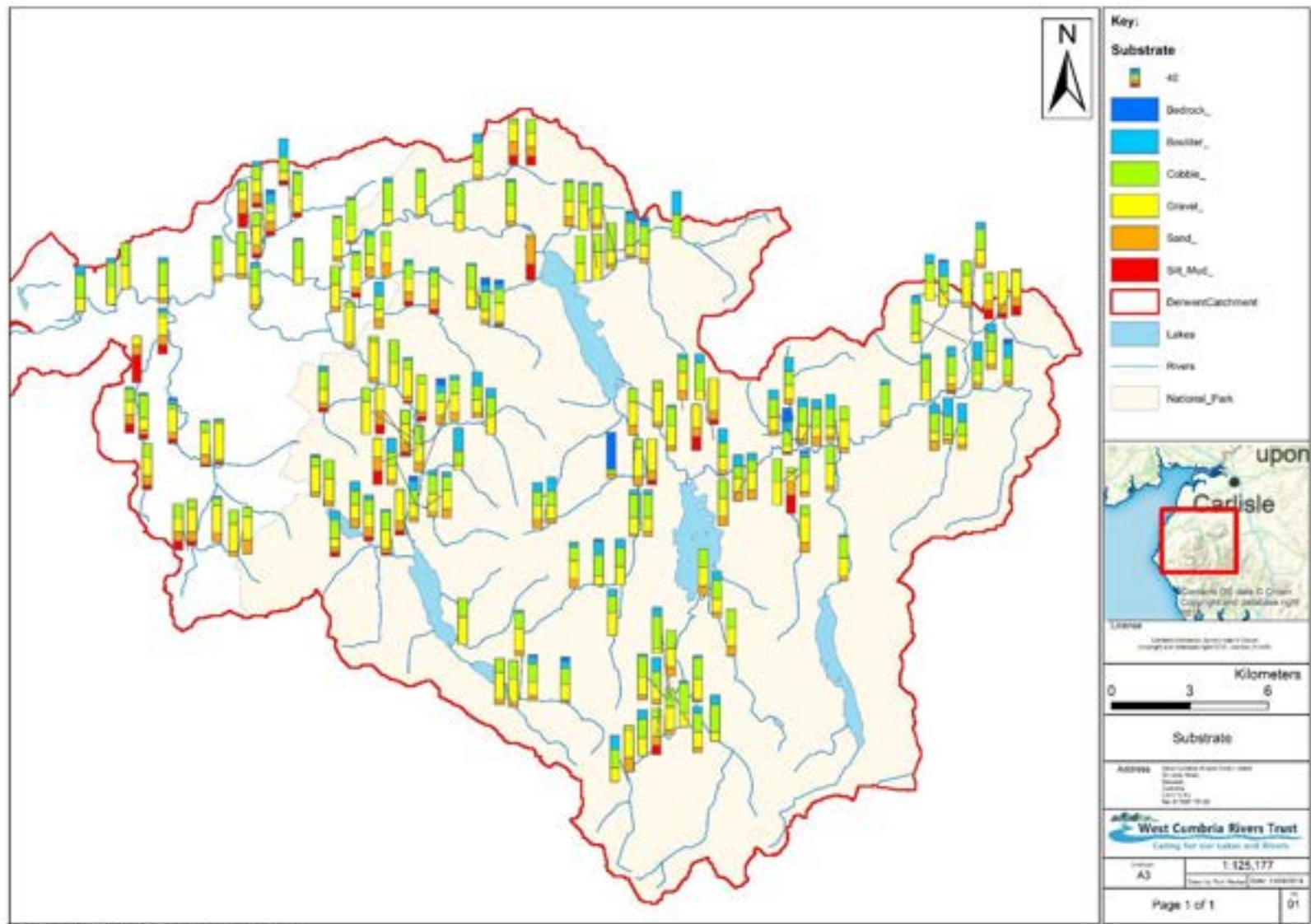


Figure 93: A diagram showing the different types of substrate and the amount of each, at each individual site.

7 Conclusion

- 7.1.1 In conclusion, 2018 was a very successful survey season, especially for salmon fry, but this largely reflects the opportunity to survey main river sites, which have not been previously surveyed due to difficulties surveying in faster/deeper water. The results show that the main river sites 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). Salmon numbers in the main river sites may also however have been slightly higher in 2018 due to the drought and drying up, or low flows, within tributaries, causing juvenile salmon to drop down into the main rivers. Despite this it is worth noting there was also an increase in the numbers of salmon fry recorded in the tributaries compared to the previous years.
- 7.1.2 Trout 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.
- 7.1.3 Whilst these surveys are primarily to determine juvenile salmonid populations, other species can be good indicators of potential problems in the river system. For example, some sites which had low or no salmonids present had large numbers of stone loach, this species is out-competed by salmonids but feeds on similar food and requires gravel for spawning in a similar manner to salmonids, however it is more resilient to siltation than salmon and trout and so indicates that by reducing silt in these areas salmonids would benefit.
- 7.1.4 This is the fourth 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 built using the results, and minor comparisons between the years have been made.
- 7.1.5 As well as the fish database we are continuously building and adding to the habitat database. This database is then used to inform WCRT and partners where habitat work would provide the greatest benefit for fish populations. Also considered in the tributary habitat scorings was the feasibility of doing the required habitat work, so that any potential improvements undertaken have the best chance of being successful. It was noted that sites with greater fish densities reflect the sections of river with good habitat.
- 7.1.6 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 if successful, will restore identified areas in need of improvement. 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 off the back of the surveys. It shows how important this work is to help provide evidence for funding bids.
- 7.1.7 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 and densities, 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 Trust's website.

8 Acknowledgements

8.1.1 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 different ways including;

- Approximately 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.
- Financial contributions from the Rivers Corridor Group, the Derwent Owners Association, Cockermouth Anglers, Bowland Game Fishing, Lord and Lady Egremont and the Patagonia Environmental Grants Fund of the Tides Foundation.
- The 36 dedicated volunteers who helped undertake the surveys throughout the summer and clocked up over 800 hours of in kind time towards the project.

8.1.2 Finally, next year (2019) is the last year of funding we have agreed. 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.

9 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*.

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*.

10 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 +		

11 Appendix B

This table is a copy of the fish data collected during the 2018 survey season and is in date order from the start of the season to the end. There is one duplicate site (surveyed during the drought and after), this is highlighted in red, and three sites where the survey wasn't completed for a variety of reasons and these are highlighted in grey.

The table includes fry and parr numbers for both trout and salmon, as well as the National Fisheries Classifications for both, along with the numbers of minor species recorded at each at each site too.

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
02/07/18	Lostrigg	NY 05558 29122	0	5	F	0	0	F	0	0	0	26	4	0	0
02/07/18	R. Marron	NY 05943 24789	12	4	C	24	5	C	4	0	0	9	0	0	0
02/07/18	R. Marron	NY 07419 23910	17	0	B	51	1	B	3	0	0	0	0	0	0
02/07/18	Black Beck	NY 07722 23988	47	3	A	0	0	F	1	0	0	0	0	1	0
03/07/18	R. Cocker	NY 14954 26332	5	1	C	32	0	B	21	0	0	0	3	0	0
03/07/18	R. Cocker	NY 13663 27128	2	0	E	137	2	A	1	0	0	1	0	0	0
03/07/18	R. Cocker	NY 12730 28468	2	1	E	67	1	A	3	0	0	5	>100	14	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
04/07/18	R. Cocker	NY 15193 22502	2	0	E	98	2	A	5	0	0	1	0	0	0
04/07/18	R. Cocker	NY 15409 23720	9	0	B	77	2	A	4	0	0	1	0	0	0
04/07/18	Hope Beck	NY 15526 23653	28	8	A	0	0	F	0	0	0	0	0	0	0
04/07/18	Liza Beck	NY 15307 22407	12	0	B	64	1	A	0	0	0	0	0	0	0
06/07/18	Whit Beck	NY 16243 25516	11	9	B	16	2	C	0	0	0	0	0	0	0
06/07/18	Whit Beck	NY 17864 25780	36	7	A	0	0	F	1	0	0	0	0	0	0
06/07/18	Liza Beck	NY 15606 22315	31	6	A	0	0	F	0	0	0	0	0	0	0
06/07/18	Liza Beck	NY 15740 21984	5	5	D	0	0	F	0	0	0	0	0	0	0
10/07/18	R. Derwent	NY 18937 33169	4	0	E	88	0	C	7	0	0	2	>10	0	0
10/07/18	R. Derwent	NY 16950 32952	0	0	F	80	0	C	14	0	0	8	2	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
10/07/18	R. Derwent	NY 14211 33225	1	0	F	132	0	B	14	0	0	3	3	0	0
11/07/18	R. Derwent	NY 15469 33551	0	0	F	168	1	B	5	0	0	43	0	0	0
11/07/18	R. Derwent	NY 12452 31780	0	0	F	45	0	B	15	0	0	6	2	0	0
11/07/18	R. Derwent	NY 12798 32475	0	0	F	78	0	A	8	0	0	16	3	0	0
12/07/18	R. Derwent	NY 12219 30950	0	0	F	123	0	A	15	0	0	0	2	0	0
12/07/18	R. Derwent	NY 10760 30902	0	0	F	23	16	E	21	0	0	>100	0	0	0
12/07/18	R. Derwent	NY 08581 31146	0	0	F	90	1	A	12	0	0	47	20	0	0
16/07/18	Sandy Beck	NY 11733 25998	13	1	B	0	0	F	1	0	0	0	0	0	0
16/07/18	Park Beck	NY 14440 20507	5	9	D	18	3	C	0	0	0	0	3	0	0
16/07/18	R. Cocker	NY 14925 21280	0	0	F	25	0	C	5	0	0	0	>100	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
16/07/18	R. Cocker	NY 14438 27003	2	1	E	95	0	A	6	0	0	4	0	0	0
17/07/18	Broughton Beck	NY 08804 31263	0	0	F	14	0	B	3	0	0	90	>100	0	0
17/07/18	R. Derwent	NY 07667 31004	0	0	F	82	1	B	12	0	0	46	0	0	0
17/07/18	R. Derwent	NY 05573 30175	0	0	F	28	1	D	10	0	0	64	1	0	0
18/07/18	R. Derwent	NY 03972 30734	0	0	F	36	2	D	6	0	0	154	1	1	0
18/07/18	R. Derwent	NY 03585 30130	0	0	F	6	5	E	17	0	0	59	0	0	0
19/07/18	Gatesgarth	NY 19272 14962	24	2	B	0	0	F	2	0	0	0	41	0	0
19/07/18	Gatesgarth	NY 19783 14929	30	2	C	0	0	F	0	0	0	0	19	0	0
19/07/18	Warnscale	NY 18968 14781	10	0	C	0	0	F	1	0	0	0	16	0	0
19/07/18	Warnscale	NY 19031 14691	11	0	C	0	0	F	0	0	0	0	25	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
19/07/18	Gatesgarth	NY 21025 14847	58	33	A	0	0	F	1	0	0	0	0	0	0
20/07/18	Whit Beck	NY 15146 24989	32	1	A	131	131	A	0	0	0	0	0	11	0
20/07/18	Whit Beck	NY 15384 24608	9	7	C	21	21	D	0	0	0	0	4	29	0
20/07/18	Whit Beck	NY 15508 24693	15	0	A	93	93	A	0	0	0	0	16	3	0
20/07/18	R. Derwent	NY 02394 29856	0	0	F	16	12	E	26	0	0	273	18	1	0
23/07/18	Keskadale Beck	NY 21358 19240	24	4	A	0	0	F	0	0	0	0	0	0	0
23/07/18	R. Derwent	NY 24899 24506	0	0	F	219	219	A	9	0	0	34	1	0	0
23/07/18	R. Derwent	NY 24573 25435	0	0	F	87	87	A	3	0	0	10	19	0	0
24/07/18	R. Greta	NY 29991 24712	1	0	E	40	5	C	0	0	0	14	0	0	0
24/07/18	Glenderaterra	NY 29905 24779	2	5	E	34	4	C	0	0	0	0	0	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
24/07/18	Glenderaterra	NY 29724 25089	30	7	B	28	5	C	0	0	0	0	0	0	0
24/07/18	Glenderaterra	NY 29553 25233	16	16	C	16	6	D	0	0	0	0	0	0	0
24/07/18	Glenderaterra	NY 29619 26326	25	12	B	11	0	D	0	0	0	0	0	0	0
31/07/18	Coledale Beck	NY 23622 23474	8	16	D	33	2	C	0	0	0	0	8	0	0
31/07/18	Coledale Beck	NY 22792 23455	5	3	D	0	0	F	4	0	0	0	0	0	0
31/07/18	Coledale Beck	NY 20237 21728	3	3	D	0	0	F	0	0	0	0	0	0	0
31/07/18	Coledale Beck	NY 19967 21530	0	0	F	0	0	F	0	0	0	0	0	0	0
01/08/18	Naddle Beck	NY 30039 20630	10	4	B	21	0	B	0	0	0	0	0	0	0
01/08/18	Naddle Beck	NY 29697 22109	14	3	B	5	0	D	0	0	0	1	10	0	0
01/08/18	Naddle Beck	NY 30001 23830	1	4	E	26	1	C	0	0	0	22	53	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
01/08/18	Naddle Beck	NY 30128 24075	0	8	F	62	12	B	0	0	0	3	0	0	0
06/08/18	Dub Beck	NY 13425 21049	0	1	F	0	2	F	5	0	0	1	3	0	0
06/08/18	Holme Beck	NY 12177 21712	0	3	F	0	1	F	0	0	0	0	2	0	0
06/08/18	Crab Tree Beck	NY 12946 21563	1	1	E	0	1	F	0	0	0	0	37	0	0
06/08/18	Dub Beck	NY 11741 22390	2	0	D	0	0	F	0	0	0	4	46	0	0
06/08/18	Dub Beck	NY 11427 22764	1	0	E	0	0	F	0	0	0	0	0	0	0
07/08/18	Lostrigg	NY 04958 23693	7	0	C	0	0	F	1	0	0	22	>100	0	0
07/08/18	Lostrigg	NY 04818 24971	18	1	B	0	0	F	0	0	0	28	>100	0	0
07/08/18	Lostrigg	NY 04487 26301	0	0	F	0	0	F	2	0	0	63	30	28	0
07/08/18	Lostrigg	NY 04562 27142	0	0	F	0	0	F	1	0	0	46	14	5	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
08/08/18	Tom Rudd Beck	NY 13113 30038	1	6	E	0	0	F	0	0	0	12	30	0	0
08/08/18	Tom Rudd Beck	NY 13874 29915	8	7	C	0	0	F	5	0	0	>100	>100	0	0
08/08/18	Tom Rudd Beck	NY 15006 30079	60	2	A	0	0	F	2	0	0	5	0	14	0
08/08/18	Tom Rudd Beck	NY 15982 29776	13	8	C	0	0	F	2	0	0	7	0	20	0
09/08/18	Glenderamackin	NY 31550 24559	3	0	E	204	5	A	3	0	0	4	0	1	0
09/08/18	St John's Beck	NY 31522 24451	2	1	E	88	2	A	6	0	0	5	4	4	1
09/08/18	St John's Beck	NY 31210 22960	1	0	E	338	6	A	1	0	0	2	2	3	0
09/08/18	St John's Beck	NY 31716 19528	4	1	D	146	19	A	3	0	0	6	0	0	0
10/08/18	R. Greta	NY 27081 23586	1	0	E	42	10	C	3	0	0	18	43	0	0
13/08/18	Newlands Beck	NY 23670 21245	18	4	B	9	3	D	0	0	0	1	5	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
13/08/18	Newlands Beck	NY 22841 17761	34	0	B	19	3	D	0	0	0	0	0	0	0
13/08/18	Keskadale Beck	NY 22309 19356	27	6	B	0	0	F	0	0	0	0	0	0	0
13/08/18	Newlands Beck	NY 23140 19374	20	3	C	6	3	E	0	0	0	0	0	0	0
14/08/18	Glenderamackin	NY 36597 29098	23	1	B	36	4	C	0	0	0	7	0	0	0
14/08/18	Barrow Beck	NY 37149 29318	0	0	F	1	1	E	0	0	0	37	59	33	0
14/08/18	Barrow Beck	NY 37428 29576	0	0	F	0	0	F	0	0	0	21	61	29	0
14/08/18	Barrow Beck	NY 37599 29716	2	0	E	0	0	F	0	0	0	28	145	16	0
14/08/18	Naddles Beck	NY 37822 29615	3	0	D	0	0	F	0	0	0	20	50	4	0
16/08/18	Glenderamackin	NY 36447 28671	15	0	C	16	1	D	2	0	0	45	9	8	0
16/08/18	Glenderamackin	NY 36450 30025	19	0	B	43	0	B	0	0	0	0	0	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
16/08/18	Glenderamackin	NY 35696 30285	27	1	B	0	0	F	0	0	0	0	0	0	0
16/08/18	Glenderamackin	NY 35560 30078	4	3	E	0	0	F	0	0	0	0	0	0	0
17/08/18	Mosedale Beck	NY 35784 24565	14	4	C	0	0	F	0	0	0	0	0	0	0
17/08/18	Mosedale Beck	NY 35736 24804	2	2	E	0	0	F	0	0	0	0	0	0	0
17/08/18	Mosedale Beck	NY 35372 26137	5	0	D	28	2	C	0	0	0	4	0	0	0
17/08/18	Glenderamackin	NY 34875 26474	4	0	E	86	2	C	0	0	0	33	0	0	0
17/08/18	Glenderamackin	NY 33311 25468	3	0	E	163	2	B	1	0	0	29	3	0	0
20/08/18	Tongue Gill	NY 24988 15043	36	0	B	0	0	F	0	0	0	2	0	0	0
20/08/18	Scalecrose Gill	NY 24950 14954	3	1	D	0	0	F	0	0	0	6	24	0	0
20/08/18	Tongue Gill	NY 25084 14997	7	1	D	0	0	F	0	0	0	1	25	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
20/08/18	Combe Gill	NY 25464 13916	6	13	D	6	1	E	2	0	0	0	5	0	0
20/08/18	R. Derwent	NY 24837 13628	2	0	E	0	0	F	3	0	0	1	1	0	0
20/08/18	R. Derwent	NY 24549 13581	6	0	D	5	1	E	0	0	0	0	0	0	0
21/08/18	R. Derwent	NY 23447 11814	0	1	F	2	6	E	0	0	0	0	0	0	0
21/08/18	Black Syke	NY 23687 12200	10	0	B	0	0	F	0	0	0	0	0	0	0
21/08/18	Black Syke	NY 24471 12854	2	15	E	1	1	E	0	0	0	0	63	0	0
21/08/18	R. Derwent	NY 23994 12803	0	0	F	0	0	F	0	0	0	0	0	0	0
23/08/18	Brockle Beck	NY 27484 22647	16	3	B	0	2	F	0	0	0	15	24	0	0
23/08/18	Brockle Beck	NY 27662 22588	9	8	C	0	0	F	0	0	0	0	0	0	0
23/08/18	Watendlath	NY 26466 18980	1	2	E	0	1	F	0	0	0	14	0	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
23/08/18	Watendlath	NY 26857 18128	8	2	D	0	0	F	0	0	0	0	12	0	0
23/08/18	Watendlath	NY 27402 16656	2	0	E	0	0	F	0	0	0	0	>100	0	0
23/08/18	Comb Gill	NY 26265 18708											>100		
24/08/18	Blumer Beck	NY 19707 35476	37	5	A	0	0	F	3	0	0	2	0	0	0
24/08/18	Coal Beck	NY 20076 32257							3	0	0	27	27	0	0
24/08/18	Coal Beck	NY 21167 33140	31	5	A	8	0	D	0	0	0	15	3	0	0
31/08/18	Dash Beck	NY 21600 31000	9	9	C	1	0	E	0	1	0	0	35	0	0
31/08/18	Dash Beck	NY 22248 31531	16	9	B	0	1	F	1	0	0	0	0	0	0
31/08/18	Dash Beck	NY 25300 32700	11	8	C	0	0	F	0	0	0	0	0	0	0
31/08/18	Chapel Beck	NY 23594 31960	30	5	B	0	1	F	0	0	0	0	0	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
31/08/18	Chapel Beck	NY 23015 31828	38	8	A	19	0	D	1	0	0	0	0	0	0
31/08/18	Chapel Beck	NY 22739 31497	23	3	B	0	0	F	2	0	0	0	11	0	0
31/08/18	Chapel Beck	NY 24060 31719	32	3	B	0	0	F	0	0	0	0	0	0	0
31/08/18	Chapel Beck	NY 22249 31083	3	0	E	7	0	E	1	0	0	0	4	0	0
03/09/18	Trout Beck	NY 38855 26976									2	>100	>100		
03/09/18	Trout Beck	NY 38035 27033	21	5	B	1	1	E	1	0	0	5	7	0	0
03/09/18	Trout Beck	NY 35860 26728	6	1	D	8	2	E	0	0	0	10	20	0	0
03/09/18	Trout Beck	NY 36861 26935	17	3	B	8	0	D	0	0	0	13	1	0	0
04/09/18	Wythop	NY 19697 31054	0	5	F	0	0	F	0	0	0	0	>10	>100	0
04/09/18	Wythop	NY 17784 29954	45	11	B	0	0	F	1	0	0	1	0	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
04/09/18	Wythop	NY 17964 29386	37	5	A	0	0	F	1	0	0	0	0	0	0
04/09/18	Wythop	NY 18483 29305	58	12	A	0	0	F	2	0	0	0	0	0	0
05/09/18	Brockle Beck	NY 27083 22273	0	1	F	0	0	F	0	0	0	>10	>100	0	0
05/09/18	Stonethwaite Beck	NY 25905 14879	9	0	C	45	9	C	0	0	0	3	0	0	0
05/09/18	R. Derwent	NY 25553 14385	20	4	C	17	3	E	0	0	0	0	5	0	0
05/09/18	Stonethwaite Beck	NY 26778 13364	1	2	E	5	25	E	0	0	0	1	0	0	0
06/09/18	Colliergate Beck	NY 06528 20704	68	53	A	3	5	E	4	2	0	0	0	0	0
06/09/18	Wood Beck	NY 06678 20880	37	23	B	57	17	B	1	0	0	0	0	0	0
06/09/18	Wood Beck	NY 07647 21009	24	17	B	0	0	F	2	0	0	0	0	0	0
06/09/18	Wisenhholme Beck	NY 08462 20573	43	14	A	0	0	F	3	0	0	0	0	0	0




Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
06/09/18	Rakegill Beck	NY 08283 20471	49	12	A	0	0	F	5	0	0	0	3	0	0
13/09/18	Blaze Beck	NY 18166 25150	47	9	A	0	0	F	0	0	0	0	0	0	0
13/09/18	Meregill Beck	NY 15111 24549	32	1	A	17	0	C	0	2	0	0	12	20	0
13/09/18	Meregill Beck	NY 15113 24309	27	0	B	3	0	E	1	0	0	0	0	2	0
13/09/18	Hope Beck	NY 16922 23793	10	11	C	0	0	F	0	0	0	0	0	0	0
13/09/18	Mill Beck	NY 17084 17085	19	0	B	0	0	F	0	0	0	0	13	0	0
28/09/18	Newlands Beck	NY 23823 22742	13	2	C	1	0	E	0	0	0	0	9	0	0
28/09/18	Newlands Beck	NY 23868 22183	7	3	D	11	1	D	0	0	0	0	0	0	0
28/09/18	Millbeck	NY 25544 26090	19	2	B	0	0	F	0	0	0	0	0	0	0
28/09/18	Applethwaite Gill	NY 26470 25631	22	1	A	0	0	F	0	0	0	0	0	0	0




Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
28/09/18	Lair Beck	NY 26060 24529	11	2	B	1	0	E	0	0	0	0	40	0	0
28/09/18	Gale Gill	NY 26728 24926	0	0	F	0	0	F	0	0	0	0	0	0	0
03/10/18	Broughton Beck	NY 08996 32535	1	0	E	0	0	F	0	0	0	>100	>100	>10	0
03/10/18	Broughton Beck	NY 09492 32437	1	6	E	1	0	E	5	0	0	>100	>100	17	0
03/10/18	Broughton Beck	NY 09166 31908	5	1	D	11	1	D	20	0	0	>100	>100	0	0
03/10/18	Brides Beck	NY 09697 32773	9	2	C	5	2	E	8	0	0	9	1	0	0
05/10/18	Brides Beck	NY 10478 33261	2	8	E	0	0	F	0	0	0	11	4	0	0
05/10/18	Broughton Beck	NY 08751 31252	4	0	E	11	0	E	5	0	0	171	6	1	0
05/10/18	Pow Beck	NY 24245 23211	25	5	C	0	0	F	4	0	0	0	0	16	0
05/10/18	Brides Beck	NY 10731 33481	0	0	F	0	0	F	3	0	0	22	0	0	0

Date	Tributary	Grid Reference	Trout Fry	Trout Parr	Trout Fry NFCS	Salmon Fry	Salmon Parr	Salmon Fry NFCS	Eel	Lamprey	Bullhead	Stone loach	Minnow	Stickle back	Signal Crayfish
09/10/18	Bitter Beck	NY 13519 31181	7	4	D	0	0	F	0	0	0	0	0	6	0
09/10/18	Bitter Beck	NY 14152 31170	30	7	B	0	0	F	0	0	0	1	0	0	0
09/10/18	Blumer Beck	NY 17654 34915	24	3	C	3	0	E	0	0	0	2	0	0	0
09/10/18	Blumer Beck	NY 19032 35490	20	3	A	7	0	D	1	0	0	8	0	0	0




12 Appendix C




A summary of the habitat data collected at each site, along with a reference photo and suggestions to improve the habitat.




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
River Marron	6	C	C	Maintain	Riparian fencing, Woody debris provision.	
River Marron	7	B	B	Maintain	Woody debris provision.	
Lostrigg Beck	1	C	F	Maintain	Riparian fencing, Woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Lostrigg Beck	2	B	F	Repair	Riparian fencing, Maintenance of culverts so they remain clear of debris, Provision of shade.	
Lostrigg Beck	3	F	F	Repair	Riparian fencing, Address bank erosion.	
Lostrigg Beck	4	F	F	Restore	Address silt drop out issues caused by slower flows in this section.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Lostrigg Beck	5	F	F	Maintain	Woody debris provision.	
Black Beck	8	A	F	Maintain	Vegetation management, Invasive species management.	
Colliergate Beck	11	A	E	Repair	Address pollution coming out of pipe upstream, Invasive species management, Riparian fencing.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Wood Beck	12	B	B	Repair	Address barrier to fish passage upstream, Riparian fencing, Invasive species management.	
Wood Beck	13	B	F	Repair	Woody debris provision, Address small barriers to fish passage on bridges.	
Wisneholme Beck	14	A	F	Repair	Riparian fencing.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Rakegill Beck	15	A	F	Repair	Priority to vegetate over and provide stability to bare earth bank on RHB.	
River Cocker	65	F	C	Repair	Address barrier to fish passage downstream, Riparian fencing, Stabilise bank erosion.	
River Cocker	66	E	A	Maintain	Invasive species management, Address minor bank erosion.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
River Cocker	68	B	A	Maintain	Invasive species management.	
River Cocker	69	C	B	Repair	Shade provision, Invasive species management, Provision of woody debris.	
River Cocker	70	E	A	Repair	Shade provision, Provision of woody debris, Address embankment on RHB.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
River Cocker	71	E	A	Repair	Provision of shade, Provision of woody debris, Invasive species management.	
River Cocker	72	E	A	Maintain	Invasive species management.	
Gatesgarth Beck	60	B	F	Maintain	Provision of more shade, Provision of woody debris.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Gatesgarth Beck	61	C	F	Repair	Riparian fencing or stock exclusion. Provision of shade, Provision of woody debris, Address small barrier to fish migration (weir) downstream.	
Gatesgarth Beck	64	A	F	Repair	Find and address source of pollution that is leading to presence of sewage fungus, Address small barrier to fish passage in low flows under bridge, Riparian fencing, Provision of shade, Provision of woody debris.	
Warnscale Beck	62	C	F	Restore	River Restoration, Address acidification issues from upstream source, Provision of shade and woody debris, Stock exclusion or riparian fencing.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Warnscale Beck	63	C	F	Restore	River Restoration, Address acidification issues from upstream source, Provision of shade and woody debris, Stock exclusion or riparian fencing.	
Mill Beck	53	B	F	Repair	Riparian fencing, Woody debris provision.	
Park Beck	54	D	C	Maintain	Riparian fencing, Invasive species control, Large woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Dub Beck	55	F	F	Repair	Riparian fencing, Address silt issues, Provision of woody debris, and shade.	
Dub Beck	58	D	F	Repair	River Restoration, Invasive species control, Riparian fencing, Provision of shade and woody debris.	
Dub Beck	59	E	F	Repair	River Restoration, Invasive species control, Riparian fencing, Provision of shade and woody debris.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Holme Beck	56	F	F	Maintain	Address minor silt issues, Woody debris provision.	
Crabtree Beck	57	E	F	Repair	Address barrier to fish passage under road, Litter picking, as large volumes of litter.	
Liza Beck	50	B	A	Repair	Address erosion, Riparian fencing, Address barrier to fish migration upstream.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Liza Beck	51	A	F	Maintain	Address downstream barrier to fish migration. River Restoration – provide substrate storage areas or stabilise the mobile substrate.	
Liza Beck	52	D	F	Maintain	River Restoration – provide substrate storage areas or stabilise the mobile substrate, Address minor erosion.	
Hope Beck	47	A	F	Repair	Invasive species control, Riparian fencing, Woody debris provision.	No Photo
Hope Beck	49	C	F	Maintain	Stock access but not sure fencing is appropriate so reduce grazing pressure or have stock exclusion areas, Provision of shade.	



Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Whit Beck	39	A	A	Maintain	Invasive species control.	No Photo
Whit Beck	40	C	D	Repair	Address siltation issues, Invasive species control.	
Whit Beck	41	A	A	Maintain	Invasive species control, Provision of shade and woody debris.	
Whit Beck	42	B	C	Maintain	Woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Whit Beck	43	A	F	Repair	Address erosion, Provision of shade and woody debris, Natural barrier - Waterfall upstream.	
Blaze Beck	44	A	F	Maintain	Good habitat.	
Meregill Beck	45	A	C	Repair	Work already done to improve issues – yet to take effect, but some siltation issues and invasive species control needed.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Meregill Beck	46	B	E	Maintain	Riparian fencing, Woody debris provision.	
Sandy Beck	38	B	F	Repair	Address source of pollution incident, Small barrier to fish migration in low flows, Invasive species control.	
Bitter Beck	29	D	F	Maintain	Minor siltation issues, Woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Bitter Beck	30	B	F	Maintain	Riparian fencing.	
Tom Rudd Beck	24	E	F	Repair	Address pollution issues upstream, Address siltation issues, Invasive species control.	
Tom Rudd Beck	25	C	F	Repair	Dismantle small rock weirs, Invasive species control, Improve stock access at ford.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Tom Rudd Beck	26	A	F	Maintain	Invasive species control, Woody debris provision.	
Tom Rudd Beck	27	C	F	Repair	Address bank erosion, Riparian fencing, Invasive species management.	
River Derwent	192	E	C	Maintain	Invasive species control, Woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
River Derwent	193	F	C	Maintain	Shade and woody debris provision, Invasive species control.	
River Derwent	194	F	B	Maintain	Shade and woody debris provision, Invasive species control.	No Photo
River Derwent	199	F	B	Repair	Address erosion, Riparian fencing, Shade provision, Woody debris provision.	
River Derwent	197	F	A	Restore	Address erosion, Invasive species control, Riparian fencing, Provision of shade and woody debris.	No Photo




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
River Derwent	196	F	B	Repair	Invasive species control, Shade and woody debris provision.	
River Derwent	195	F	A	Maintain	Invasive species control, Shade and woody debris provision.	
River Derwent	198	F	E	Maintain	Invasive species control, Shade provision and woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
River Derwent	205	F	A	Repair	Riparian fencing, Invasive species control, Shade and woody debris provision.	
River Derwent	203	F	B	Repair	Invasive species control, Shade and woody debris provision.	No Photo
River Derwent	204	F	D	Maintain	Invasive species control, Woody debris and shade provision.	
River Derwent	200	F	D	Restore	Address major erosion, Riparian fencing on RHB, Invasive species control, Shade and woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
River Derwent	201	F	E	Repair	Continue to allow re-naturalisation that is already occurring, Invasive species control, Shade and woody debris provision.	
River Derwent	202	F	E	Restore	Address massive barriers to fish migration u/s and d/s, Invasive species control, Riparian fencing, Shade and woody debris provision.	No Photo
Broughton Beck	18	E	F	Repair	Riparian fencing, Bank erosion and poaching, Address very silty conditions.	
Broughton Beck	20	E	E	Maintain	Invasive species control, Address siltation issues, Investigate and address source of pollution that turns water grey.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Broughton Beck	21	D	D	Repair	Address siltation issues, Invasive species control, Shade and woody debris provision.	
Broughton Beck	22	F	B	Maintain	Address siltation issues, Riparian fencing, Invasive species control.	
Brides Beck	212	C	E	Repair	Address barriers to fish migration upstream.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Brides Beck	19	E	F	Repair	Address barriers to fish migration upstream and downstream, Invasive species control, Riparian fencing.	
Brides Beck	213	F	F	Repair	Address barrier to fish migration downstream, Riparian fencing, Address source of pollution turning water grey.	
Blumer Beck	75	C	E	Maintain	Invasive species control, Riparian fencing.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Blumer Beck	76	A	D	Maintain	Address silt issues especially in vicinity of bridge, Invasive species control.	
Blumer Beck	77	A	F	Repair	Address siltation and erosion, Riparian fencing.	
Wythop Beck	78	F	F	Repair	Address siltation issues, Invasive species control, River Restoration.	

Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Wythop Beck	80	B	F	Repair	Invasive species control, Lots of embankments and reinforced concrete banks that need naturalising.	
Wythop Beck	81	A	F	Maintain	Riparian fencing.	
Wythop Beck	82	A	F	Maintain	Address minor erosion.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Coal Beck	86	A	D	Maintain	Invasive species control.	
Dash Beck	88	C	E	Maintain	Minor erosion.	No Photo
Dash Beck	89	B	F	Maintain	Woody debris provision.	No Photo
Dash Beck	91	C	F	Maintain	Woody debris provision, Address barrier to fish migration upstream.	No Photo
Chapel Beck	92	B	F	Maintain	Riparian fencing, Invasive species control.	
Chapel Beck	93	A	D	Maintain	Invasive species control, Woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Chapel Beck	94	B	F	Maintain	Woody debris provision, Invasive species control.	
Chapel Beck	95	B	F	Maintain	Riparian fencing on LHB.	
Chapel Beck	96	E	E	Repair	Invasive species management, Riparian fencing, River Restoration.	No Photo
River Derwent	189	F	A	Repair	Address major erosion and deposition issues, Riparian fencing, Invasive species control.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
River Derwent	190	F	A	Repair	Riparian fencing, Invasive species control, Address bank erosion, Woody debris provision.	No Photo
Millbeck	120	B	F	Maintain	River Restoration, Invasive species control.	
Applethwaite Gill	122	A	F	Maintain	River Restoration.	
Lair Beck	124	B	E	Repair	Address major siltation issues, Invasive species control.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Gale Gill	125	F	F	Restore	River Restoration, Address barrier to fish migration downstream, Riparian fencing, Shade and woody debris provision.	
Coledale Beck	100	D	C	Repair	Riparian fencing.	
Coledale Beck	101	D	F	Repair	Barrier to fish migration – gravel trap!	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Coledale Beck	102	D	F	Maintain	Shade and woody debris provision.	
Coledale Beck	103	F	F	Maintain	Shade and woody debris provision.	
Newlands Beck	108	C	E	Repair	River Restoration, Invasive species control, Woody debris and in river vegetation provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Newlands Beck	109	D	D	Repair	River Restoration, Address bank erosion, Invasive species control, Woody debris and in river vegetation provision.	
Newlands Beck	110	B	D	Repair	River Restoration, Woody Debris provision.	
Newlands Beck	111	B	D	Maintain	Shade and woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Newlands Beck	116	C	E	Maintain	Riparian fencing, Woody debris provision.	
Keskadale Beck	114	B	F	Maintain	Riparian fencing, Woody debris provision.	
Keskadale Beck	115	A	F	Repair	Riparian fencing, Woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Pow Beck	105	C	F	Repair	Riparian fencing, Address siltation issues.	
Upper Derwent	138	C	E	Maintain	Woody debris provision.	
Upper Derwent	141	E	F	Repair	Riparian fencing, River restoration, Woody debris and in river vegetation provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Upper Derwent	142	D	E	Maintain	Maintain good habitat.	
Upper Derwent	211	F	F	Restore	River restoration, Shade and woody debris provision.	
Upper Derwent	144	F	E	Repair	River restoration, Shade and woody debris provision.	



Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Black Syke	145	B	F	Repair	Riparian fencing, Shade and woody debris provision.	
Black Syke	146	E	E	Maintain	Address siltation.	No Photo
Combe Gill	139	D	E	Maintain	Maintain good habitat.	
Stonethwaite Beck	137	C	C	Maintain	Naturalise the bank reinforcements and reduce embankments.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Stonethwaite Beck	140	E	E	Maintain	Shade and woody debris provision, Stabilise substrate through river restoration.	
Tongue Gill	134	B	F	Repair	River restoration, Riparian fencing on RHB.	
Scaleclose Gill	135	D	F	Repair	River restoration, Shade and woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Tongue Gill	136	D	F	Repair	River restoration, Address erosion, Riparian fencing.	
Watendlath Beck	129	E	F	Repair	River restoration, Riparian fencing, Woody debris provision.	
Watendlath Beck	130	D	F	Maintain	Woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Watendlath Beck	131	E	F	Repair	Address minor erosion, Riparian fencing, Shade and woody debris provision.	
Brockle Beck	126	F	F	Repair	Invasive species control, Address pollution issues.	
Brockle Beck	127	B	F	Repair	Address barrier to fish passage under bridge.	

Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Brockle Beck	128	C	F	Maintain	Maintain good habitat.	
River Greta	148	E	C	Repair	Invasive species control, Shade and woody debris provision.	
River Greta	154	E	C	Maintain	Riparian fencing, Woody debris provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Glenderaterra	160	E	C	Maintain	River restoration to provide depositional areas or sediment storage areas.	
Glenderaterra	161	B	C	Maintain	Invasive species control, Woody debris provision.	
Glenderaterra	162	C	D	Maintain	Address bank erosion, Invasive species control.	No Photo




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Glenderaterra	164	B	D	Maintain	Shade and woody debris provision.	
Naddle Beck	150	B	B	Repair	Address barrier to fish upstream under road, Cease gravel removal activities, Shade and woody debris provision.	
Naddle Beck	151	B	D	Repair	Address siltation issues, Riparian fencing, Reinststate trees once pipeline works have finished.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Naddle Beck	152	E	C	Maintain	Address minor poaching at watering hole, Maintain work already undertaken to allow benefits to occur.	
Naddle Beck	153	F	B	Repair	Riparian fencing, Shade and woody debris provision, Remove concrete embankments downstream which are now partial barrier to fish migration.	
St John's Beck	156	E	A	Maintain	Riparian fencing on RHB, Shade and tree provision.	




Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
St John's Beck	157	E	A	Repair	Move ford or put in bridge, Remove stone embankments on LHB, Shade and woody debris provision, Riparian fencing.	
St John's Beck	158	D	A	Maintain	Vegetation management.	
Mosedale Beck	165	C	F	Repair	Tree and woody debris provision, Bank erosion, Riparian fencing on LHB.	



Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Mosedale Beck	166	E	F	Repair	Tree and woody debris provision, Riparian fencing on LHB.	
Mosedale Beck	168	D	C	Maintain	Riparian fencing.	
Glenderamackin	155	E	A	Maintain	Invasive species control, Riparian fencing.	

Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Glenderamackin	174	E	B	Maintain	Woody debris provision, Maintain good habitat.	
Glenderamackin	169	E	C	Repair	Riparian fencing, Shade and woody debris provision.	
Glenderamackin	176	C	D	Maintain	Address bank erosion, Maintain work already been done here to allow benefits to take effect.	

Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Glenderamackin	177	B	C	Maintain	Address bank erosion, Riparian fencing.	
Glenderamackin	186	B	B	Repair	River restoration, Shade and woody debris provision.	
Glenderamackin	187	B	F	Repair	Address bank erosion, Shade and woody debris provision.	

Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Glenderamackin	188	E	F	Repair	Address bank erosion, Shade and woody debris provision.	
Barrow Beck	179	F	E	Repair	Riparian fencing, Shade and woody debris provision.	
Barrow Beck	180	F	F	Repair	Riparian fencing, Address siltation issues, Shade and woody debris provision.	

Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Barrow Beck	181	E	F	Repair	Address bank erosion, Riparian fencing.	
Barrow Beck	182	D	F	Repair	Riparian fencing, Shade and woody debris provision.	
Trout Beck	172	B	E	Maintain	Maintain good habitat.	

Watercourse	Site Number	Salmonid fry NCFS category from 2018 data		Site Habitat Category	Opportunities for:	Picture
		Trout	Salmon			
Trout Beck	206	B	D	Maintain	Maintain good habitat.	
Trout Beck	173	D	E	Maintain	Maintain good habitat.	

13 Appendix D

A summary of the habitat data by watercourse, including notes on the effects of the drought, general notes and opportunities for improvement works.

Watercourse	Number of Sites	Salmonid fry NCFs category from 2018 data		Tributary Habitat Category	Drought effects	Opportunities for:	Comments
		Trout (A-F)	Salmon (A-F)				
River Marron	2 sites	B-C	B-C	Maintain	Low Flows	Invasive species control, riparian fencing, woody debris provision.	Ideally the number of survey sites needed increased.
Lostrigg Beck	5 sites	B-F	F	Repair	Low Flows	Riparian fencing, woody debris and shade provision, address siltation and bank erosion.	Intermittent significant farm pollution, good mix of substrates and habitat and therefore fish numbers should be better than they are. Culverts need regularly cleaning of debris.
Black Beck	1 site	A	F	Maintain	Low Flows	Vegetation management, invasive species control.	Upstream habitat unknown, more sites or walkover surveys.
Colliergate Beck	1 site	A	E	Repair	Unknown	Riparian fencing, invasive species control.	Upstream habitat unknown, more sites or walkover surveys required. Address pollution coming from upstream pipe.
Wood Beck	2 sites	B	B-F	Repair	Unknown	Address barrier to fish migration, tree planting, riparian fencing, invasive species control.	No fish access beyond Gatra Farm due to manmade barrier. Some fencing and tree planting needed.
Rakegill Beck	1 site	A	F	Repair	Unknown	Address total barrier to fish migration, vegetation management, bank stabilisation.	Right hand bank has had some recent structural changes, the wire baskets full of rock have been ripped out and lots of debris and bare concrete left, then further downstream the bank has been regraded with lots of bare soil left which needs vegetating as soon as possible. Upstream habitat unknown, but beck does flow out of Cogra Moss.

Watercourse	Number of Sites	Salmonid fry NCFs category from 2018 data		Tributary Habitat Category	Drought effects	Opportunities for:	Comments
		A	F				
Wisenholme Beck	1 site	A	F	Repair	Unknown	Address total barrier to fish migration, riparian fencing.	Opportunities for riparian fencing, embanked and modified on left hand bank as it flows parallel to the road.
River Cocker	7 sites	B-F	A-C	Repair	Unknown	Invasive species control, minor bank erosion repairs, riparian fencing, woody debris and shade provision, and river restoration.	Some areas of really good habitat and others that need improvement/full restoration.
Gatesgarth	3 sites	A-C	F	Repair	Low Flows	Shade and woody debris provision, riparian fencing.	Exposed and open, some tree planting would provide shade and habitat. Sewage fungus present at the bridge on Buttermere side of Honister Pass. Small barrier to fish passage on bridge during low flows.
Warnscale	2 sites	C	F	Restore	Low Flows	Riparian fencing, shade and woody debris provision, river restoration.	Heavily straightened and dredged in the past and suffers from acidification from an upstream source. It is slowly starting to re-naturalise now it is less intensively grazed.
Mill Beck	1 site	B	F	Repair	Unknown	Riparian fencing, tree planting, woody debris provision, river restoration.	Not in its original course, upper reaches rockier with less vegetation.
Park Beck	1 site	D	C	Repair	Low Flows	Riparian fencing, invasive species control, woody debris provision, river restoration.	Restore modified section up-stream of Crummock Water. Good habitat in section surveyed, largest fish of the season was recorded here, more survey sites for next year.
Dub Beck	3 sites	D-F	F	Repair	Low Flows	Invasive species control, riparian fencing, tree planting.	Historically dredged, intermittent farm pollution, it is starting to recover but areas that need fencing to reduce poaching. Himalayan balsam present in abundance.

Watercourse	Number of Sites	Salmonid fry NCFS category from 2018 data		Tributary Habitat Category	Drought effects	Opportunities for:	Comments
Crab Tree Beck	1 site	E	F	Repair	Low Flows	Address barrier to fish passage, litter pick.	Barrier to fish passage under road. Lots of rubbish and fly tipping as house not currently occupied.
Holme Beck	1 site	F	F	Maintain	Low Flows	Woody debris provision.	Good habitat, but only parr were recorded here.
Liza Beck	3 sites	A-D	A-F	Repair	Low Flows	Address barrier to fish migration.	Barrier to fish migration downstream of the road, large sediment yields for its size and a flashy system leading to unstable spawning areas and loss of redds during flood events.
Hope Beck	2 sites	A-C	F	Repair	Low Flows	Invasive species control, riparian fencing, tree planting and woody debris provision, reduce dredging.	Straightened and periodically dredged, large sediment yields and a flashy system leading to unstable spawning areas and loss of redds during flood events. Himalayan balsam present.
Whit Beck	6 sites	A-C	A-F	Maintain	Low Flows	Invasive species control, tree planting and woody debris provision.	Good spawning tributary, river restoration site doing well, upper reaches predominantly more trout as it is upland habitat.
Meregill Beck	2 sites	A-B	C-E	Maintain	Unknown	Invasive species control, riparian fencing upstream.	Gravels have recently been placed in beck at several locations and fenced off, seeing improved fish numbers in recent years. Himalayan balsam prevalent.
Paddle Beck	-	-	-	Repair	Dry in places	Riparian fencing, vegetation management, address pollution issues.	Very shallow beck, intermittent farm pollution issues, sections very overgrown with lots of weed and silt.
Sandy Beck	1 site	B	F	Repair	Dry in places	Potential river restoration project, invasive species control.	Sections historically have been modified i.e. raised, straightened and not in original course which led to dry reaches during the drought. Potential for a river restoration project. Needs some invasive species management as Himalayan balsam a big issue. Lots of a fine orange sediment currently in beck from an upstream source, at one of the upper sites.

Watercourse	Number of Sites	Salmonid fry NCFs category from 2018 data		Tributary Habitat Category	Drought effects	Opportunities for:	Comments
Little Sandy Beck	-	-	-	Repair	Dry in places	Address pollution issues, gravel replenishment, riparian fencing in places.	Upper reaches are modified, silty and suffer from farm pollution. Middle reaches have had some recent habitat improvement works undertaken, which are yet to take effect. Lower reaches are prone to siltation caused by high flows in River Cocker.
Bitter Beck	2 sites	B-D	F	Repair	Dry in places	Riparian fencing, maintain/improve fish passage.	Upstream habitat is good. However, fish passage into the beck remains difficult through the downstream section i.e. is culverted through the town.
Tom Rudd Beck	4 sites	A-E	F	Repair	Low Flows	Riparian fencing, invasive species control, woody debris provision.	Lots of intermittent pollution from both agriculture and construction, fish passage into beck at confluence is difficult. Have been some recent modifications in form of rock weirs and gravel removal.
Main River Derwent downstream of Bassenthwaite Lake	14 sites	E-F	A-E	Varied	Low Flows	Invasive species control, shade and woody debris provision, riparian fencing, address bank erosion and major barriers to fish migration.	Of the 14 sites there is a mixture of Maintain (6), Repair (5), Restore (3). Overall good habitat, needs more shade and woody debris provision, lots of algae present. Despite the good habitat though the major issue is the two large weirs (Yearl and Coups) downstream impeding upstream and downstream migration.
Broughton Beck	4 sites	D-F	B-F	Repair	Low Flows	Riparian fencing, invasive species control, address barrier to fish passage, address pollution issues.	Needs fencing in places, big silt issues and intermittent farm pollution. Lots of Himalayan balsam present. Carr Beck very little flow, but deep glides, gets shallower upstream. Barrier to fish passage where old railway embankments have fallen in.
Brides Beck	3 sites	C-F	E-F	Repair	Low Flows	Removal of the two barriers to fish migration, riparian fencing, address pollution issues, invasive species control.	Removing two barriers will open up the whole system for fish. Needs fencing in places, and has been dredged historically. United Utilities pipeline is crossing this beck in several places and also has the new treatment works being built in its headwaters leading to silt and sediment pollution issues during construction. Himalayan balsam is also prevalent.

Watercourse	Number of Sites	Salmonid fry NCFs category from 2018 data		Tributary Habitat Category	Drought effects	Opportunities for:	Comments
Eller Beck	-	-	-	Repair	Dry in places	Address pollution issues, river restoration.	This has been moved and no tin original course in lower reaches and therefore bone dry during the drought. Middle reaches flow over limestone and are very prone to drying up. Not surveyed this year. Usually good habitat in areas that are surveyed, upper reaches habitat unknown. Pollution issues known to occur.
Blumer Beck	3 sites	A-C	D-F	Maintain	Low Flows	Invasive species control, riparian fencing, tree planting.	Siltation issues, possible blockage under A591 which needs investigating, running very turbid by Beckgrains Bridge post drought.
Wythop Beck	4 sites	A-F	F	Repair	Low Flows	River restoration in lower reaches, invasive species control, riparian fencing.	Upper reaches good habitat, lots of dappled shade and woody debris, lower reaches through village heavily modified and reinforced, then downstream of the village, dredged, straightened and over deep, with silt issues and lots of Himalayan balsam.
Coal Beck	1 site	A	D	Repair	Low Flows	Invasive species control.	Good habitat in places, lots of silt and heavily modified in places especially through the caravan parks, water very cloudy and smelly on day of survey – possible pollution from United Utilities pipeline and septic tanks/ dirty water drains from caravan park.
Dash Beck	3 sites	B-C	E-F	Maintain	Low Flows	Riparian fencing, woody debris provision.	Some natural waterfalls along its course, United Utilities to stop abstracting from it in the future, overall good habitat but modified in lower reaches. Lower reach could tie into river restoration project in Chapel Beck.
Chapel Beck	5 sites	A-E	D-F	Maintain	Low Flows	Riparian fencing, invasive species control, woody debris provision.	Overall good habitat especially in middle and upper reaches, potential river restoration site downstream of the road.
Main River Derwent between Lakes	2 sites	F	A	Repair	Low Flows	Riparian fencing, invasive species control, address bank erosion issues.	Lots of erosion and deposition in this section during large flood events, some areas of bank stabilisation completed in the past, has been dredged historically.

Watercourse	Number of Sites	Salmonid fry NCFS category from 2018 data		Tributary Habitat Category	Drought effects	Opportunities for:	Comments
Millbeck	1 site	B	F	Restore	Dry in places	River restoration project downstream of village, tree planting, riparian fencing, woody debris provision.	Section in village and downstream, is heavily modified and historically dredged. Steep gill like section upstream of village – natural falls.
Applethwaite Gill	1 site	A	F	Restore	Dry in places	River restoration project downstream of village, tree planting, riparian fencing, woody debris provision.	Steep section upstream of village, possible barrier to fish migration in village, heavily modified and reinforced in village and downstream. Regularly dries up in raised section downstream of village.
Lair Beck	2 sites	B-F	E-F	Repair	Dry in places	Address barrier and siltation issues, riparian fencing, shade and woody debris provision.	Upstream of caravan park, no fish at all due to historic pollution incident and barrier to fish migration within caravan park, middle section suffers from siltation and road runoff as runs parallel to A66.
Coledale Beck	4 sites	D-F	C-F	Repair	Low Flows	Riparian fencing, Tree planting.	Heavy metal issues, but improving due to new treatment ponds, two barriers to fish migration, one the gravel trap in the village and the other just upstream of the village, caused by a bolder slide in gorge. Suffers from lots of landslips, and is heavily engineered and modified in and downstream of the village.
Newlands Beck	5 sites	B-D	D-E	Repair	Dry in places	River restoration, riparian fencing, tree planting, invasive species control, woody debris provision.	Upper reaches are ok but need fencing and tree planting. Downstream of Stair major restoration is needed as it has very minimal instream habitat and is very homogeneous and straight, with large embankments. Bank revetments are now degrading and leading to erosion issues. This summer flow was reduced to pool and trickles. Is affected by heavy metals.

Watercourse	Number of Sites	Salmonid fry NCFs category from 2018 data		Tributary Habitat Category	Drought effects	Opportunities for:	Comments
Keskadale Beck	2 sites	A-B	F	Repair	Low Flows	Tree planting, riparian fencing, woody debris provision.	Habitat is sufficient, but could be better especially in upper reaches where there is a lack of shade and woody debris.
Pow Beck	1 site	C	F	Repair	Low Flows	River restoration, riparian fencing, provision of some spawning gravels in lower reaches.	Major siltation issues, probably due to bank erosion, poaching and being over wide, some good in river habitat and vegetation in places, railway embankments falling in, dredged historically.
Upper Derwent (River Derwent upstream of Derwentwater)	5 sites	C-F	E-F	Restore	Dry in places	River Restoration, tree planting, riparian fencing, woody debris provision.	Sections are straightened, raised and not in original channel, this leads to large sections drying up and becoming choked with gravels, needs shade and woody debris provision especially in upper reaches.
Black Syke	2 sites	B-E	E-F	Maintain	Low Flows	Riparian fencing, gravel provision, shade and woody debris provision in upper reaches.	Is now mostly all fenced and habitat is improving, lots of in river vegetation and woody debris, was gravel starved in past but is improving, may need reconnecting to a sediment source to ensure gravels are travelling through the system.
Combe Gill	1 site	D	E	Maintain	Unknown	Tree planting, woody debris provision, riparian fencing.	Can suffer from low flows, waterfall and weir upstream as barrier to fish migration, historically dredged.
Stonethwaite Beck	2 sites	C-E	C-E	Repair	Unknown	Tree planting, woody debris provision.	Some good habitat and salmon fry and parr found at both sites, but over wide, high sediment loads, potentially dried up during drought as very low river levels towards end of season even after rain. Very flashy system.
Tongue Gill	3 sites	B-D	F	Restore	Dry in places	River restoration, tree planting, riparian fencing, woody debris provision.	Not in original course and bottom section known to dry up which it did during the drought. Historically, a great tributary for salmon, but has been dredged and modified. Lots of deposition of sediments in lower reaches.

Watercourse	Number of Sites	Salmonid fry NCFs category from 2018 data		Tributary Habitat Category	Drought effects	Opportunities for:	Comments
Comb Beck	-	-	-	Repair	Dry in places	Riparian fencing, tree planting.	Dried up in places during the drought, especially near to road bridge. Look at site selection next year. Historically dredged, so gravel starved but they are now slowly making their way in to the system.
Watendlath Beck	3 sites	D-E	F	Repair	Unknown	Tree planting, riparian fencing, woody debris provision.	Natural falls at Lodore Hotel. Straightened and modified in places, lower reaches need fencing, upper reaches need tree planting and woody debris.
Brockle Beck	3 sites	B-F	F	Repair	Unknown	Invasive species control, address barrier to fish passage and pollution issues.	River is actively changing in lower reaches through wet woodland, upper reaches modified in past, intermittent farm pollution. Barrier to fish passage under Springs Road has been addressed in past but still difficult for fish to ascend.
River Greta	2 sites	E	C	Repair	Low Flows	Invasive species control, shade and woody debris provision, riparian fencing.	Add more sites next year, heavily modified through Keswick.
Glenderaterra	4 sites	B-E	C-D	Maintain	Low Flows	Tree planting, invasive species control, woody debris provision, address bank erosion.	Good habitat throughout most survey sites, however has large sediment yields and a flashy system leading to unstable spawning areas and loss of redds during flood events. Heavy metal impacts from past mining, upper reaches need tree planting to provide shade.
Whit Beck	-	-	-	Repair	Dry in places	Riparian fencing, address barrier to fish passage, tree planting.	Severe flood damage during Desmond, good shade and habitat in lower reaches, tree planting needed in upper reaches, barrier to fish passage under track as perched culvert.
Naddle Beck	4 sites	B-F	B-D	Repair	Low Flows	Shade and woody debris provision, riparian fencing, more gravel provision, improve fish passage.	Barrier to fish migration under A591 and issues at culverts under A66. Gravel seeding has been very successful in encouraging salmon spawning. UU pipeline to cross beck in a few places, trees removed in preparation. Some good in river vegetation/habitat in places despite gravel removal and siltation.

Watercourse	Number of Sites	Salmonid fry NCFs category from 2018 data		Tributary Habitat Category	Drought effects	Opportunities for:	Comments
St John's Beck	3 sites	D-E	A	Repair	Low Flows – but regulated by water company	Shade and woody debris provision, riparian fencing, tree planting.	Great numbers of fish, due to compensatory flows and in river habitat. Lots of potential for fencing, woody debris and dappled shade. The habitat isn't actually the best it could be, despite being the best tributary in the catchment for salmon fry. Has been modified in places with concrete bank protection in places.
Mosedale Beck	3 sites	C-E	C-F	Repair	Low Flows	Shade and woody debris provision, riparian fencing, address bank erosion.	Upper reaches are step-pool river type, more suited to trout. Very low flows, possible it did dry up in places during the drought. Lower reaches, potentially modified in past. Tree cover is sparse in upper reaches and potential for fencing in the lower reaches.
Glenderamackin	8 sites	B-E	A-F	Maintain	Low Flows	Invasive species control, riparian fencing, shade and woody debris provision, address bank erosion in places.	Overall habitat is good with sections of good in river habitat and good marginal habitat. River has been straightened and modified in places, it also has a large sediment yield and is a flashy system leading to unstable spawning areas and loss of redds during big flood events.
Barrow Beck	4 sites	D-F	E-F	Repair	Low Flows	Tree planting, riparian fencing, more gravel provision and redirecting flood flows, woody debris provision.	Work has been undertaken to seed gravels and improve gravel conveyance, further projects are planned to further improve habitat and slow the flow of water.
Trout Beck	3 sites	B-D	D-E	Maintain	Unknown	Riparian fencing, tree planting, provide gravel stabilisation features.	Variable habitat at the three sites, riparian fencing needed in places, good juvenile substrate but few spawning opportunities. Upper reaches need tree planting and have been modified in the past.