

**A REPORT ON THE 1993 STRATEGIC STOCK ASSESSMENT SURVEY
OF THE EAMONT CATCHMENT
WITH PARTICULAR REFERENCE TO SALMONID FISH**



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1. SUMMARY

Thirty seven sites in the Eamont catchment were electro-fished in 1993 to assess juvenile salmon and trout (salmonid) populations. The survey was targeted at fish normally less than 2 years old by selecting sites with a shallow riffle pool structure. The deeper (>1m) waters associated with larger trout were not surveyed so it is essential to interpret the results for older brown trout with caution.

The densities found of each age class of salmon and trout are presented on maps as abundance classes. Total Salmonid Density Classes are also presented.

Salmonid fish were found at all sites.

At 24 sites (65%) Total Salmonid Density Index was class C or better representing a healthy situation for these sites.

At the remaining 13 sites (35%) the Total Salmonid Density Index was class D. Some of these sites were in reaches which scored well at other sites and were due to particular features of the stretch surveyed. However, 8 of these sites were on reaches highlighted as areas of concern. Upon which further recommendations have been given.

Estimates of the production of salmon and trout for each age group are presented and discussed.

Salmon were present in naturally high densities in the upper reaches of Dacre Beck, Bannerdale Beck and Rampsgill Beck. In Pasture Beck and Grisedale Beck the parr year class was present in high densities after stocking of fry in 1992.

Dacre Beck was found to be the main area of juvenile salmon production. The contribution of the main river is also large but it was not possible to produce an estimate of numbers and further work is recommended.

The salmon parr year class was particularly strong in both stocked and unstocked streams. Parr numbers being higher than fry in 9 out of 11 streams.

Salmon were absent from 11 sites in the catchment, 2 of which were above Aira Force, an impassible barrier. Salmon were also absent from several of the sites in the Martindale streams, but trout were present in high densities at these sites. The absence of salmon in Dovedale, Deepdale and Kirkstone Becks are probably due to the low productivity of these streams and the lack of spawning adults in this area.

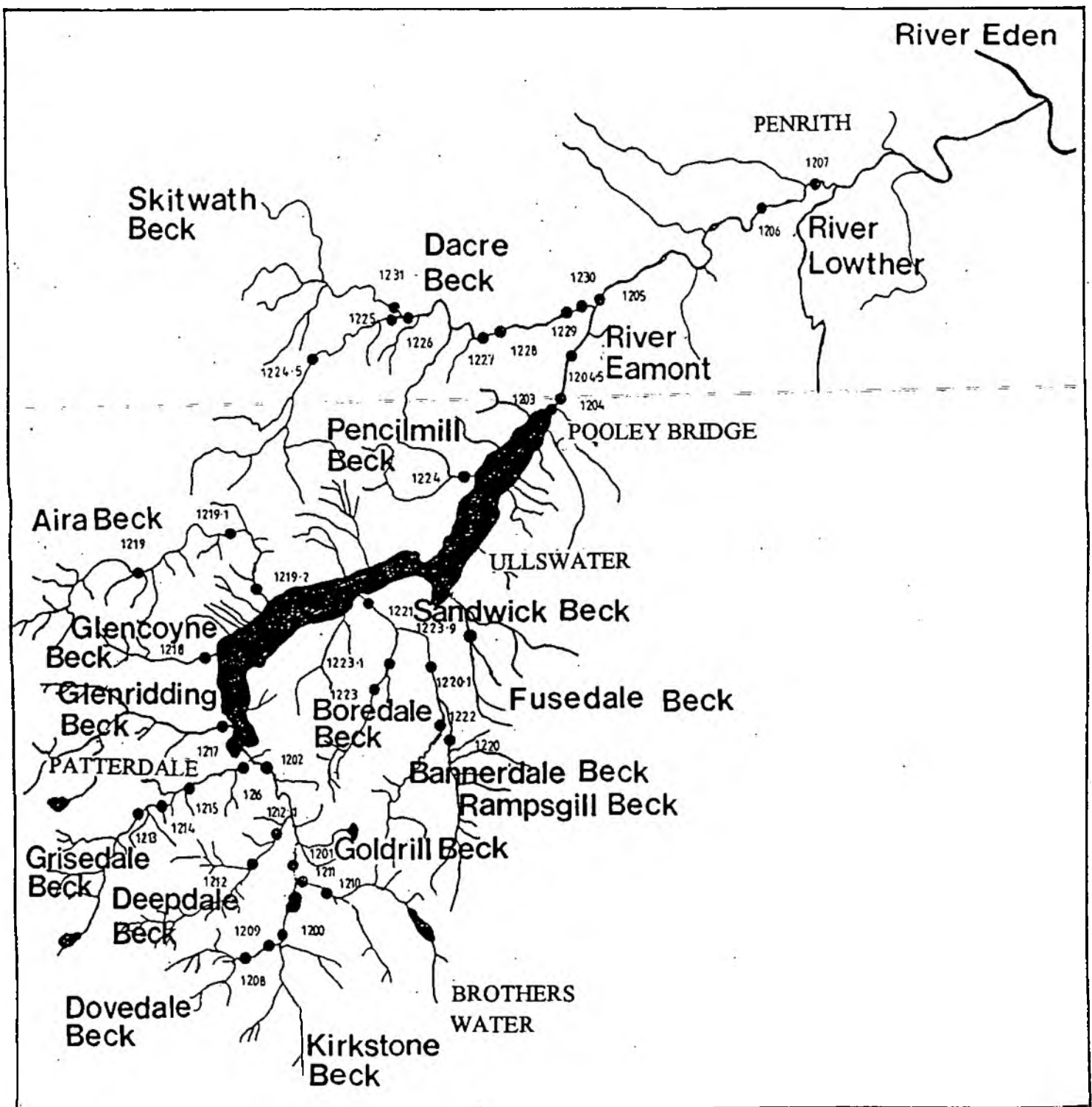
Trout were present at all the sites surveyed. High densities of fry were found in the Martindale streams, Dovedale Beck and Glencoyne Beck. Older trout scored class C or above at 18 sites (49%). At many of these sites the population was made up of several year classes indicating resident populations. However, the results indicate that Aira Beck, Glencoyne Beck, Glenridding Beck and Grisedale Beck hold a proportion of lake trout progeny in their lower reaches.

Eels were present at three quarters of the sites surveyed. Stoneloach, minnow and bullhead were

present at many sites often in large numbers. Sticklebacks were only present at 6 sites. Lamprey, pike, perch and dace were not found in the survey and in general were not expected given the nature of the areas surveyed.

FIGURE 1

EAMONT CATCHMENT



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2. INTRODUCTION

Under the Water Resources Act, 1991, the Environment Agency (EA) has a responsibility to maintain, improve and develop fisheries. In order to help accomplish this the EA is collecting baseline data on fish populations. A strategic survey programme has been established with the primary aim of assessing juvenile salmonid populations using electrofishing methods. Salmonid fish include salmon (*Salmo salar*) and both the migratory and residential forms of the trout (*Salmo trutta*). The survey was targeted at young salmonids (normally less than 2 years old) by selecting sites with riffle / pool structure. The deeper waters associated with larger trout were not surveyed as available methods are not effective. Consequently results for older trout populations should be interpreted with caution.

Strategic surveys are being conducted throughout the N.R.A. and surveys have been conducted concurrently throughout Cumbria. The strategic survey is designed to be a rolling programme initially surveying new catchments or parts of catchments each year. It is expected to take 8 years to complete the cycle on the Eden and Border Esk, due to the large size of their catchments.

The full Eamont system was surveyed as shown in Figure 1.

3. MATERIALS & METHODS

3.1. *Catchment Description*

The River Eamont is a major tributary of the River Eden, in Cumbria. It drains Ullswater Lake (NGR NY 3916- NY 4624) and the surrounding area. Most of the main river and Dacre Beck drains carboniferous limestone and conglomerate. The geology around Ullswater consists of sedimentary rocks in the lower lying areas and igneous rocks in the higher areas. This would imply that the upper reaches of the Ullswater tributaries may be less nutrient rich and in some streams the productivity is poor with low numbers of invertebrates. However, the species of invertebrates present are those found in clean water and the inferred National Water Quality for the catchment (Appendix 4) is class 1A throughout.

For the purpose of this report the streams flowing into Ullswater Lake are split into Western, Southern and Eastern groups, as detailed below.

WESTERN - Pencilmill Beck, Aira Beck, Glencoyne Beck and Glenridding Beck.

SOUTHERN - Goldrill Beck and its tributaries; Deepdale Beck, Pasture Beck, Grisedale Beck, Dovedale Beck and Kirkstone Beck.

EASTERN - Sandwich Beck, Rampsgill Beck, Howgrain Beck, Bannerdale Beck, Boredale Beck and Fusedale Beck ie streams of the Martindale area..

3.2. *Methodology*

Thirty seven sites were surveyed as part of the strategic survey in 1993.

Sites were selected at approximately 1km intervals where access was suitable and were approximately 50m long. Where possible, sites were selected to target juvenile salmonid populations.

The sites were electrofished once through without stop nets. From the raw data, densities were calculated (see Appendix 1 for calculations) and expressed as "numbers of fish per 100m² of wetted area". All sites were then assigned to Abundance Classes (Table 1).

TABLE 1 - Abundance classes

Density of Salmonid fish expressed as numbers per 100m²

ABUNDANCE	0+ (FRY)	>0+ (PARR & OLDER)
A	>100	>20
B	50.01 - 100.00	10.01 - 20.00
C	25.01 - 50.00	5.01 - 10.00
D	0.01 - 25.00	0.01 - 5.00
E	0	0

Abundance class maps were produced for salmon 0+ (fry), salmon >0+, trout 0+ (fry), trout >0+ and total salmonids (Figures 2-6).

Maps of stocking location, redd counts and obstacles to migratory fish are also included (Figures 7-9 respectively).

Coarse fish were also recorded. Eels (*Anguilla anguilla*) were counted and measured and minor coarse fish, e.g. stone loach (*Neomacheilus barbatulus*) and minnows (*Phoxinus phoxinus*), were recorded according to the following abundance classes; 0, 1-10, 11-100, 101-1,000 and 1000+.

4. RESULTS & DISCUSSION

4.1 Abundance Class Breakdown

Thirty seven sites were surveyed as part of the Strategic survey in 1993. The number of sites in the respective abundance classes are shown below.

TABLE 2 : Abundance classes for survey sites on the Eamont Catchment 1993.

ABUNDANCE CLASS	SALMON		TROUT	
	0+	>0+	0+	>0+
A	1	5	1	2
B	0	3	0	11
C	5	7	6	5
D	16	10	27	15
E	15	12	3	4

4.2 Salmon

4.2.1 Overview

Most of the catchment is accessible to migratory fish except for Aira Beck where there is a large waterfall above site 1219.2. There are a number of weirs on the main river, but they are not barriers to migrating fish. (Figure 9).

0+ salmon are not present in high densities in the Eamont catchment, except for Dacre Beck and one site on Bannerdale Beck (1222).

Dacre Beck supported high densities of salmon fry with one site scoring Class A and four sites Class C out of 8 sites. This is the only major tributary which does not involve adults passing through the lake. Spawning is particularly abundant in the upper reaches known as Matterdale Beck (Figure 8).

Fifteen sites in the Eamont catchment scored class C or above for >0+ salmon, these were distributed in Dacre Beck, Grisedale Beck, Pasture Beck, the lower site on Aira Beck and amongst the eastern Ullswater streams.

In Sandwich Beck, Bannerdale Beck and Rampsgill Beck the salmon parr year class was more successful than the fry. This area was not influenced by stocking. This is the likely product of the fluctuating redd numbers observed in this area (Blif Parsons pers. comms.) and as such a large variation in year class strength is likely to be seen in these streams.

Salmon are absent from 11 sites in the catchment. The lack of salmon in 4 sites on the eastern Ullswater streams in Martindale may be due to the habitat. Some areas are more suitable for trout, being narrow (<5m wide), mostly tree lined and having abundant bankside cover. However, the salmon population is probably sparse and/or spasmodic as 4 redds were counted on Boredale Beck in 1989.

The reason for the lack of salmon in Pencilmill Beck is not clear as the habitat appears suitable with plenty of instream cover. However it is narrow (<4m wide) and salmon tend to be found in wider streams (>5m wide).

The bed material at site 1212 on Deepdale Beck, where salmon were absent, was mainly bedrock and provided little cover for fish.

The reason for the apparent lack of a natural salmon population upstream of Brothers Water (i.e. in Kirkstone and Dovedale Becks) is probably due to the lack of migrating adults. Few have been seen in this area (Bliff Parsons pers comm). The physical habitat and invertebrate population appear suitable although streams <5m wide tend to support higher densities of trout than salmon. It is possible that Brothers Water may act as a disincentive to migrating fish

4.2.1. Stocking success

A total of 47,000 salmon fry were stocked in 1992, none were stocked in 1993. The fry stocked in 1992 would be parr in the 1993 survey.

It is not possible, without detailed studies, to assess the success, or otherwise, of stocking exercises. However, some comment can be made, but these comments assume that year class strength is constant from year to year which is not always the case, for example, the parr year class was stronger in the eastern Ullswater streams in 1993.

Salmon parr (>0+) were stocked as fry in 1992 into Goldrill Beck and Pasture Beck, Kirkstone Beck, Glenridding Beck, Grisedale Beck and Dovedale Beck (Figure 7). It is not possible to distinguish stocked fish from natural progeny. Thus the amount of natural spawning and survival is masked by the stocking.

The stocking of 33,000 fry into Pasture and Goldrill Becks appeared successful in the upper reaches (i.e. Pasture Beck) where the parr densities were 3 times as high as the fry densities. However, the densities in Goldrill Beck were low and the stocking appears to have failed.

The parr population of Grisedale Beck appears to have been enhanced by the 1992 stocking.

Despite stocking 6,000 fry in Glenridding Beck in 1992 the densities of both fry and parr were extremely low indicating that the stocking had failed. However this is based on only one survey site and fish may have survived upstream. Lead contamination from the disused mines in this catchment is likely to influence the survival of fish in this stream. The physical habitat should support a higher density than was found.

On Dovedale and Kirkstone Becks none of the stocked fish were found in the survey, however,

the numbers expected to survive would be low. If 1,500 fry were stocked and survival was 1 in 5 as indicated by studies in the North West Region, then only 300 parr from each stream would be expected. So it is possible that these fish did survive in these proportions, but the small number of parr were not present in the survey sites.

4.2.3 Main River Eamont

Salmon fry and parr densities were low in the main river. Sampling difficulties often occur on large rivers. Due to the large area the fish are able to escape the electric field and the flow can wash fish away before capture. However, there is some evidence that densities vary greatly as a special study site revealed large numbers of fry and parr at site 1204.5.

High numbers of salmon redds are laid down annually in the main river downstream of the lake although they are not counted every year due to high flows. Figure 8 shows the Redd Counts for the winter of 1991/2. Despite the high numbers of redds, survival appears to be low. The pattern of large scale spawning activity, but poor survival has been observed by the NRA downstream of several of the Cumbrian Lakes including Bassenthwaite, Windermere, Coniston and Wastwater and is the subject of ongoing investigations.

4.3 Trout

There is no significant sea trout run in the Eamont (Blff Parsons pers. comm.) so the trout populations can be considered to be resident within the streams or lake within the catchment.

4.3.1 Trout 0+

Although trout fry were present at the majority of sites in the Eamont catchment, many of these sites yielded low densities. As these trout populations are mainly resident and will represent several year classes, only a small number of fry is required to maintain the population.

There were 7 sites with higher densities which were mainly concentrated in the eastern Ullswater tributaries in Martindale. Glencoyne Beck and Dovedale Beck also have sites of higher densities.

Trout fry were absent at 3 sites. Two of these were on Dacre Beck (1227 & 1228) and they had large quantities of bedrock and few fish of any species were found. The other site on Goldrill Beck (1202) was mainly a pool, but did contain a small section of riffle where trout fry were expected and the reason for the lack of trout is not clear.

4.3.2 Trout >0+

The streams in the upper area of the catchment (Fusedale Beck and above) had mostly high densities of older trout. Many of these trout were >2+ (i.e. greater than 2 years old) which implies that they were resident populations. This is especially in the eastern Ullswater streams of Martindale. Takeable trout were found at several of these sites with 9 on Boredale Beck (1223) and 11 on Fusedale Beck (1223.9). Aira Beck, Glencoyne Beck, Glenridding Beck and Grisedale Beck have a high proportion of 1+ parr with no 2+ or older trout indicating that the adult fish are

resident elsewhere. As there is no significant sea trout run on the Eamont it is likely that these fish are the progeny of lake trout.

Older trout were absent from only 4 sites, site 1201 on Goldrill Beck, site 1222 on Bannerdale Beck and the 2 lower sites on the main river. The site on Goldrill Beck (1201) consisted of mainly fry habitat and with little bankside cover, older fish would not have been expected. The lowest site on the main river, prior to the confluence with the Lowther, appeared to have available cover for older trout, but none were found. The reason for the lack of older trout at the other two sites is not clear.

4.4. Total Salmonid Density

An index of total salmonid density for each site was calculated (Appendix 2) combining salmon and trout for both size classes.

TABLE 3 :Total Salmonid Density Classes in the Eamont Catchment 1993.

DENSITY CLASS	NUMBER
A	5
B	12
C	7
D	13
E	0

Salmonid fish were present at all sites in the Eamont catchment.

If a site scores Class D for total salmonid density this indicates a low fish population. Most of the Class D sites were spread throughout the system, interspersed with sites of high salmonid density. There are 4 areas of concern : the reach above the waterfall on Aira Beck, Pencilmill Beck, the River Eamont downstream of Ullswater and Goldrill Beck.

4.4.1 Aira Beck

The two sites above the waterfall on Aira Beck (1219 & 1219.1) both scored class D for total salmonid density. The upper site (1219) scored well for trout parr, but the total score was just pulled down to a class D due to the natural absence of salmon. The middle site (1219.1) at Dockray had few trout of any size. The site was expected to have held more fish than were caught. The habitat in this reach appeared suitable for trout populations, although ironically better suited for salmon being wider than 5m and having abundant cover in the rapid midstream riffles. Further investigation of this reach including the smaller tributaries is necessary to understand the situation better.

4.4.2. Pencilmill Beck

A similar situation occurs on Pencilmill Beck as on Aira Beck but it is a small stream and the habitat appears suitable for trout with ample cover. However low densities were found in the survey.

4.4.3. River Eamont

The 3 sites on the River Eamont all scored Class D for Total Salmonid Index. Fish are able to evade capture to a greater degree in large rivers compared to smaller streams due to increased flow and width. Considering these difficulties the recorded densities should be regarded as a minimum estimate of the actual densities which are likely to have been higher.

Suitable sites for survey work were scarce, due to sampling difficulties. As a result we have scant information on the main river. Three sites totalling 150 metres along approximately 10 miles of river is not sufficient to make assumptions about the whole length. However, there is not a suitable method available for sampling the deeper water where resident trout would be expected. An adaption of survey methodology is needed to gain more information. This would only be possible for the shallower water.

The 1/2 mile of the River Eamont from the outflow of Ullswater to the NRA weir downstream (NGR NY 472260) is slow flowing with little broken water. As a result of the slow flow the stream bed consists of a large proportion of small stones (<6cm) which surround the larger cobbles and boulders thus embedding them. A large number of redds are found in this reach below the lake outflow and this indicates that the gravels must be loose enough for the fish to spawn in and that the embedded substrate is not compacted. However this leaves little instream cover for salmon fry or parr.

4.4.4. Goldrill Beck

The low densities of fish found in Goldrill Beck are not what would be expected of a stream of this nature. The physical habitat appears suitable and the invertebrate populations abundant. Further work is required to try to determine the reasons for the low fish population.

4.5 Salmonid Production Figures

To manage a fishery effectively it is important to know the numbers of fish produced in different parts of the catchment. This is not necessarily the sites with the highest densities. A large stream area producing a low density is likely to produce as many if not more fish than a small area yielding a high density. The calculations are based upon stream areas (length x width) multiplied by fish densities to produce an estimate of the number of fish in a stream or reach. The lengths used normally extend only 0.5 km upstream of the most upstream site on each reach. The widths are those measures during the survey. Notes and assumptions are presented in Appendix 3. On most streams there is still a significant length upstream of the top site which is therefore not included in the production estimates. This may be significant, particularly for trout fry production, which occurs significantly in these areas. Data for salmon and trout are shown in Tables 4 and 5 respectively. It is important to note that these figures do not include unsurveyed streams.

The main river has not been included in the production figures as the survey sites are only representative of shallow, sampleable areas and so do not represent the river as a whole. Juvenile salmonid production could only be assessed if the proportion of the river which is shallow riffle is known.

4.5.1. Salmon Production (Table 4)

The overall totals for fry and parr are approximately equal which shows that in 1993 the parr year class was particularly strong compared to the fry year class. The parr year class would normally be expected to be approximately 1/5th of the fry class due to natural mortality. The parr year class was stronger than the fry class in all groups except Dacre Beck and if individual streams are considered it was stronger in 9 of the 11 streams and in both stocked and unstocked streams.

The importance of Dacre Beck to the salmon production of the Eamont is clear with an estimate of 66% of the fry and 34% of the parr being produced there.

The parr production appears to be split approximately into thirds shared between Dacre Beck, the Southern streams of Goldrill Beck and the Eastern streams of Martindale. The western streams of Glenridding Beck, Aira Beck, and Glencoyne Beck did not contribute significantly to the salmon stocks.

It is important to be aware that a considerable amount of spawning occurs on the main river. The contribution of the main river is likely to be significant due to its large area, despite the lower densities found. The River Eamont from Ullswater to the Eden confluence consists of 40 % of the area of stream available in the catchment, of the streams that were surveyed.

It is important to note that there are many areas of stream that were not surveyed.

Shearer (1984a) estimates that survival from parr to 2+ smolt is approximately 50% and that survival at sea is 20-30% for grilse. If these estimates are applied to total parr numbers this would yield 10.5 thousand smolts and an estimated grilse return of 2,104 to 3,157.

However, work in Northern Ireland (Kennedy, in Solomon 1983) estimates the smolt to grilse survival to range from 3-13%. For this data this would yield 316 to 1,368.

How these survival estimates relate to fish from the Eamont catchment is unknown.

It must be borne in mind that these figures are an underestimate for the catchment because the main river has not been included and is likely to contribute greatly to the overall salmon production.

4.5.2 Trout Production (Table 5)

Estimated overall trout fry production was slightly greater than that for salmon fry production. The majority of production was found in the Eastern streams of Martindale and the Southern streams of Goldrill Beck which produced 75% between them. Grisedale Beck, Bannerdale Beck, Rampsgill Beck and Boredale Beck produced the highest numbers.

The number of older trout (ie those fish of 1 year and older) was about half that for the fry. Aira Beck alone contributed over 15% of the older trout despite having low densities. High numbers were also found in Dacre Beck, Grisedale Beck, Sandwick Beck and Boredale Beck.

If the estimated salmon and trout production are compared (Tables 3 and 4) it can be seen that some streams support high numbers of both salmon and trout namely Pasture Beck, Grisedale Beck, Sandwick Beck and Bannerdale Beck. Dacre Beck is also important for both species.

When considering these figures it is important to remember that these estimates of trout numbers do not include the main river for the reasons given earlier.

Many of the trout found in the eastern streams were >2+ fish and appeared to be members of a resident brown trout population. As previously discussed the Western streams and nearby Grisedale Beck appear to have a higher proportion of 1+ trout, many of which could be lake trout progeny. It is not believed that sea trout are present in the Eamont system around Ullswater whereas lake trout are seen entering these streams at spawning time and dropping out shortly afterwards (Blif Parsons pers. comm.).

TABLE 4 : Estimated Salmon Production by stream reach and section of the Eamont Catchment excluding the main river.
(S Indicates that this year class was stocked)

AREA	STREAM	1993 FRY	1993 PARR
DACRE BECK	Dacre Beck	15,079 (66%)	7,199 (34%)
SOUTHERN STREAMS	Goldrill Beck	2,391	443 S
	Deepdale Beck	778	566
	Pasture Beck	859	2,695 S
	Grisedale Beck	421	2,198 S
Sub Total		4,449 (19.5%)	5,902 (28%)
WESTERN STREAMS	Glenridding Beck	91	132 S
	Glencoyne Beck	0	99
	Aira Beck	0	939
Sub Total		91 (0.5%)	1,170 (6%)
EASTERN STREAMS	Sandwick Beck	363	3,391
	Rampsgill Beck	367	640
	Howgrain Beck	0	103
	Bannerdale Beck	2,417	2,640
Sub Total		3,147 (14%)	6,774 (32%)
TOTAL		22,766	21,045

TABLE 5 : Estimated Trout Production by stream reach and section of the Eamont Catchment excluding the main river.

AREA	STREAM	FRY PRODUCTION	PARR PRODUCTION
DACRE BECK	Dacre Beck	1,659 (6.5%)	1,543 (11%)
SOUTHERN STREAMS	Goldrill Beck	716	154
	Deepdale Beck	1,165	315
	Pasture Beck	1,080	665
	Grisedale Beck	2,720	1,715
	Dovedale Beck	936	716
	Kirkstone Beck	303	965
Sub Total		6,920 (26%)	4,530 (33%)
WESTERN STREAMS	Glenridding Beck	136	312
	Glencoyne Beck	866	362
	Aira Beck	1,184	2,129
	Pencilmill Beck	380	145
Sub Total		2,566 (10%)	2,948 (21%)
EASTERN STREAMS	Sandwick Beck	977	1,112
	Rampsgill Beck	2,109	944
	Howgrain Beck	1,024	327
	Bannerdale Beck	3,292	0
	Boredale Beck	6,450	1,454
	Fusedale Beck	1,307	884
Sub Total		15,159 (57.5%)	4,721 (34%)
TOTAL		26,304	13,742

4.6. Major and Minor Coarse Fish

4.6.1. Major Coarse Fish

No pike (*Esox lucius*), dace (*Leuciscus leuciscus*) or perch (*Perca fluviatilis*) were found in the River Eamont survey. Eels were present at three quarters of the sites with the highest density in the main river. However, when surveying, salmonids are caught preferentially so the eel densities should be strictly considered as a minimum estimate.

4.6.2. Minor Coarse Fish

Only 6 sites fished had no minor coarse fish present at all. Stoneloach, Minnow and bullhead (*Cottus gobio*) were present at many sites with all 3 species in large numbers. Sticklebacks (*Gasterosteus aculeatus*) were present at only 6 sites on the Eamont system, in the main river and Dacre Beck. Lamprey (*Lampetra planeri* & *L. fluviatilis*) were not found in the survey.

5. CONCLUSIONS

1. The River Eamont and Dacre Beck were the main production areas for salmon within the Eamont catchment. The salmon numbers produced by the Eastern streams of Martindale and Southern Ullswater streams in the vicinity of Patterdale were also important.
2. The tributaries of Ullswater were the main areas of trout production. The Southern and Eastern Ullswater streams held mainly resident trout populations. The western Ullswater streams and Grisedale Beck hold some lake trout progeny.
3. As found in other catchments the densities of trout fry were low, but the populations of older trout are high enough to indicate that low fry densities are probably sufficient to maintain the resident populations.
4. The stronger parr year class provides some evidence that stocking of salmon fry in 1992 has been successful in Pasture Beck and Grisedale Beck, but this year class was naturally stronger in the eastern streams of Martindale and so the stronger parr class may be due to natural factors and not stocking.
5. It is not possible to assess the production of the main river due to sampling difficulties, the small number of survey sites and the need to assess the amount of juvenile habitat. Production in the main river is likely to be high and significant for the catchment given the large number of redds and the large wetted area available.
6. There are four areas of concern that were highlighted by the survey;- Aira Beck, Pencilmill Beck, the River Eamont and Goldrill Beck.

6. RECOMMENDATIONS

1. Further investigation is required into salmon survival on the main river. Comparing the number and distribution of redds with the corresponding fry and parr numbers found nearby and downstream in the succeeding years. The suitability of the river bed to provide cover for fry and parr should be evaluated.
2. The proportion of riffle and pool areas on the main river should to be assessed to allow an estimate of fry, parr and smolt production to be made and the contribution made by the main river to production of the catchment.
3. An adaption of survey methods is needed to effectively survey areas of the main river. During a recent survey of the Border Esk a net was placed lengthways in the river to reduce the width of the survey site. The area on only one side of the net was electro-fished and the net acted as a barrier to fish attempting to escape the electric field - one of the problems encountered on wide rivers. It would be appropriate to try this on the River Eamont.
4. A biological macro-invertebrate survey is required on Pencilmill Beck and Aira Beck and its tributaries to investigate the low densities of trout found in these reaches. If the results indicate good water quality and an abundance of food for fish, then further sites, as detailed overleaf, should be electro-fished to examine the densities and distribution of the trout population.
5. It would be advantageous to commission a genetic study of the salmon stocks to determine whether there are different populations of salmon in different areas of the catchment e.g. around the lake, in the main river and Dacre Beck. This would aid educated decisions with regard to management of the stocks.

Proposed Electrofishing Sites on Aira Beck & Pencilmill Beck

STREAM	LOCATION	GRID REFERENCE	SITE NUMBER
Aira Beck	Douthwaite Head	NY 372 207	1219.00
Aira Beck		NY 376 207	
Aira Beck	Crookwath	NY 383 215	
Aira Beck	Dockray	NY 394 215	1219.10
Coegill Beck	Prior to Aira Beck	NY 371 207	
Little Aira Beck	At Ford	NY 375 206	
Un-named Tributary	Crookwath	NY 382 214	
Riddings Beck	Dockray	NY 398 217	
Pencilmill Beck	Watermillock	NY 447 227	1224.00
Pencilmill Beck	Pencilmill Bridge	NY 434 223	

7. REFERENCES

Farooqi, M. & Aprahamian, M. W. (1993). The calibration of a semi quantitative approach to fish assessment in North West Region of the N.R.A. *NRA/NW/FTR/93/4*.

Shearer (1984a). The natural mortality at sea for North Esk salmon. *International Council for the Exploration of the sea C.M. 1984/M:23*.

Solomon (1993). Determining the role of restocking in fisheries management, Welsh rivers - stocking and taking stock. *Proceedings of the joint N.R.A. Welsh Region / WSTAA Seminars 1993. N.R.A. Welsh Region Technical Fisheries Report No. 4*

8. GLOSSARY

Salmonid	A salmonid is a member of the family salmonidae which includes salmon, trout and charr. For the purposes of this survey it includes salmon (<i>Salmo salar</i>) and trout (<i>Salmo trutta</i>).
Fry	Fry are fish which have hatched out in the current year, normally in May for salmon and trout. They normally range in size from 4 - 7.5cm at the time of year of these surveys.
0+	0+ fish are those which are less than one year old (but older than 0 years!). For the purposes of this survey, 0+ and fry are interchangeable but later in the year or early the following spring such fish would be large enough to be called parr. In warmer, more productive waters, 0+ fish may reach parr size by the end of the first summer.
Parr	Parr are salmon or trout which are normally 8 - 12cm long and have parr marks on the sides of the body (i.e. dark vertical bars).
>0+	>0+ (greater than 0+) fish are those which are one year old or older. For salmon these fish are all parr i.e. the freshwater stage prior to becoming a smolt. For trout the >0+ group includes all ages other than 0+ (i.e. parr and adult fish) and therefore can include several year classes. These year classes can be denoted >1+, >2+ etc.
Smolt	Smolts are the silvery stage of salmon or sea trout at which they migrate to sea. Smolts are typically 12 - 16cms long.
Grilse	Grilse are salmon which have spent only one winter at sea before returning to freshwater.

Multi-seawinter Fish As the name implies this refers to fish which have spent two or more winters at sea before returning to freshwater.

Redd A redd is the "nest" which female salmon and trout cut to lay their ova in. Redds have a characteristic shape and in low, clear waters can be counted and mapped.

Year Class All the fish which hatch in one particular year belong to the same year class. The success or "strength" of a year class depends upon a number of factors and it can vary greatly from year to year.

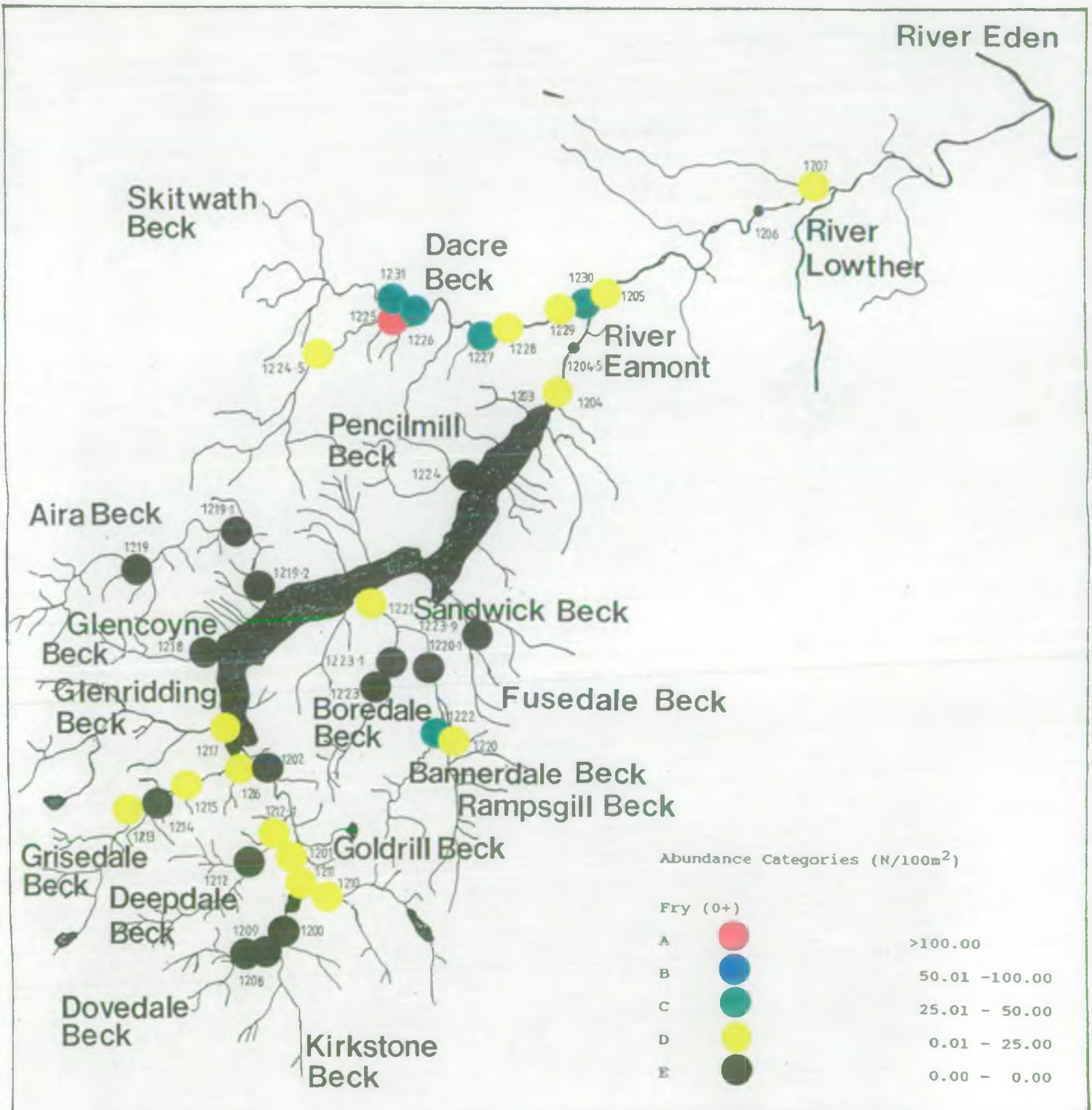
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EAMONT CATCHMENT

FIGURE 2

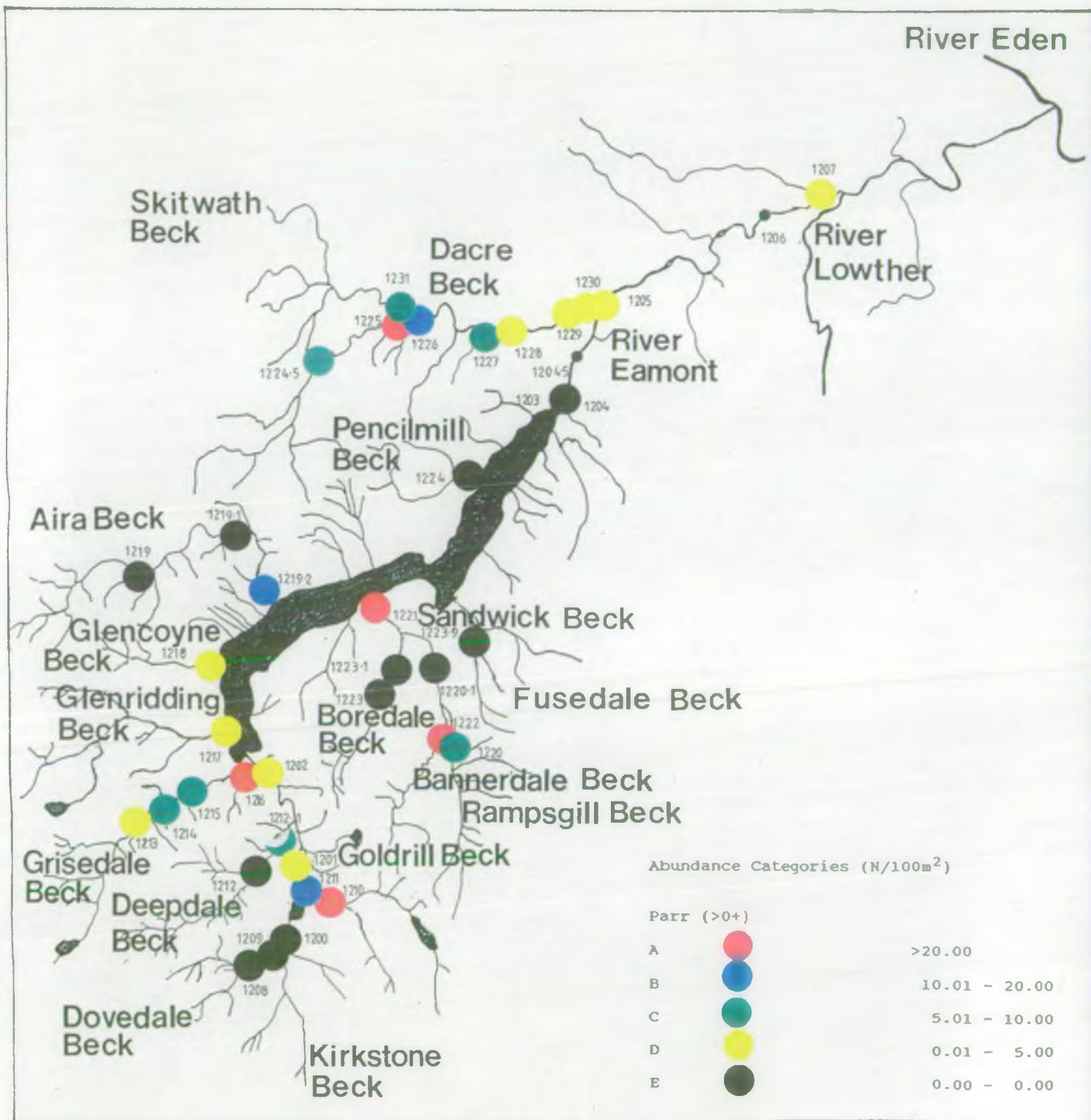
Salmon Fry (0+) Densities In 1993



EAMONT CATCHMENT

FIGURE 3

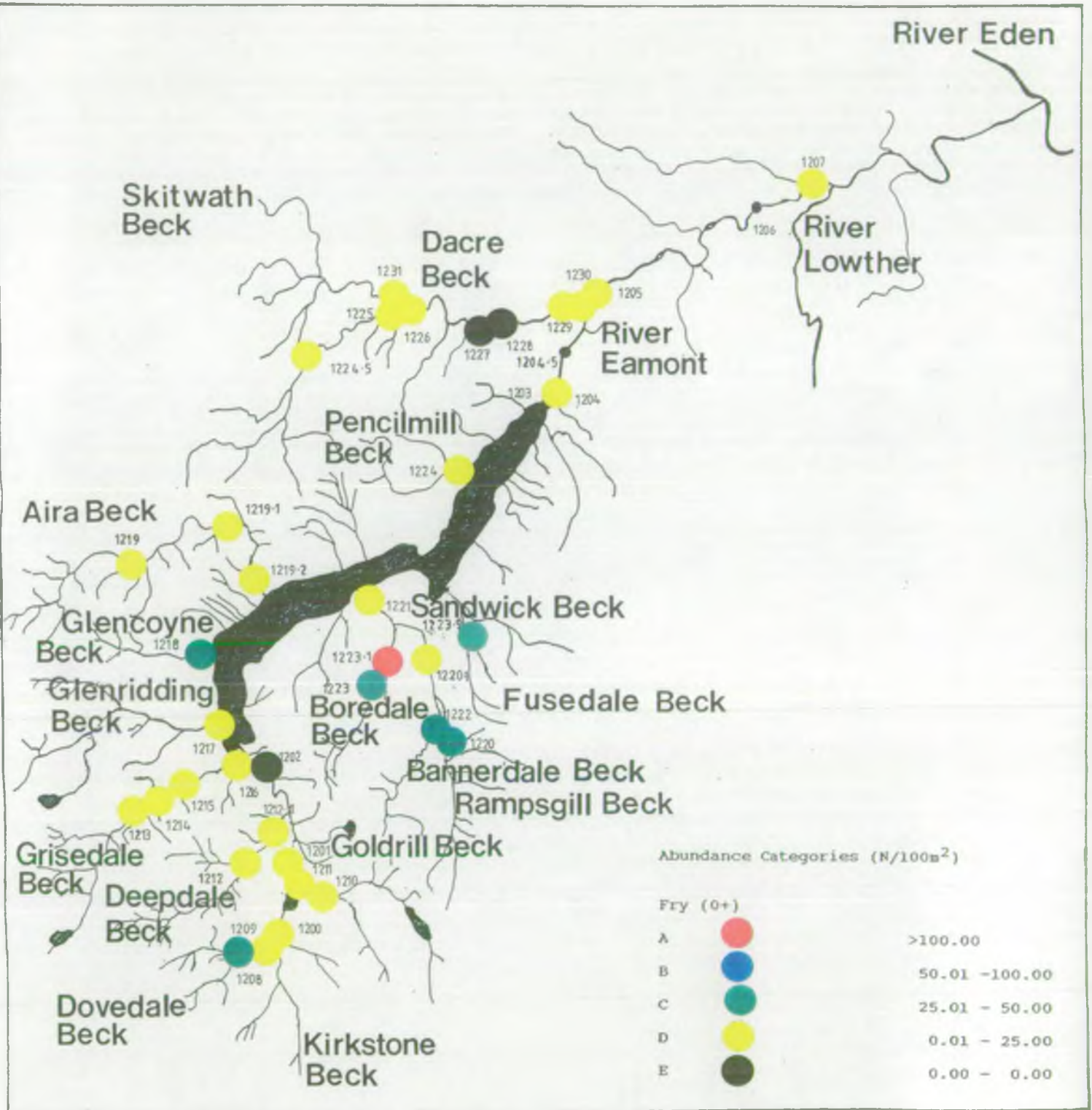
Salmon Parr (>0+) Densities In 1993



[illegible]

FIGURE 4

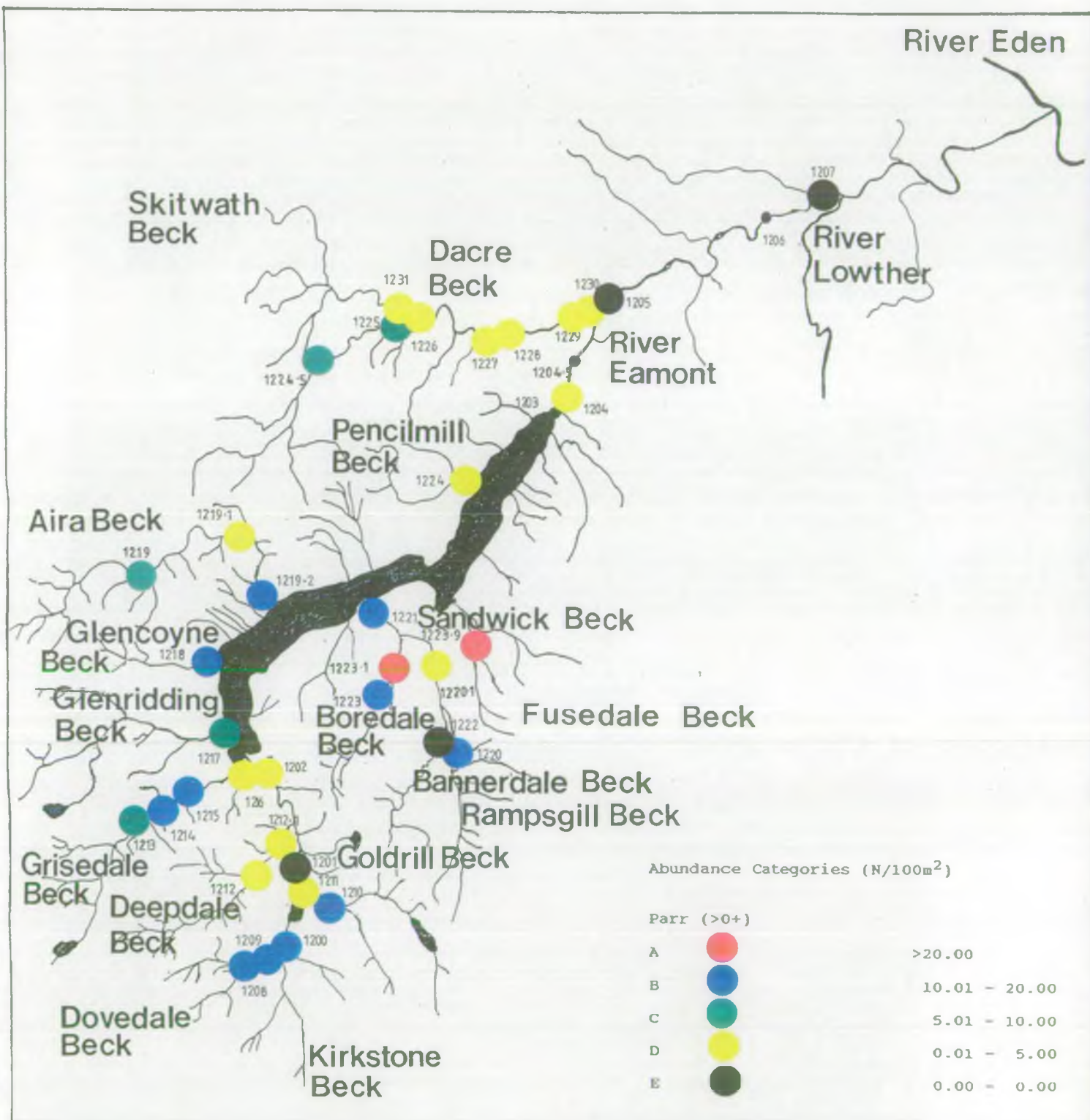
Trout Fry (0+) Densities In 1993



EAMONT CATCHMENT

FIGURE 5

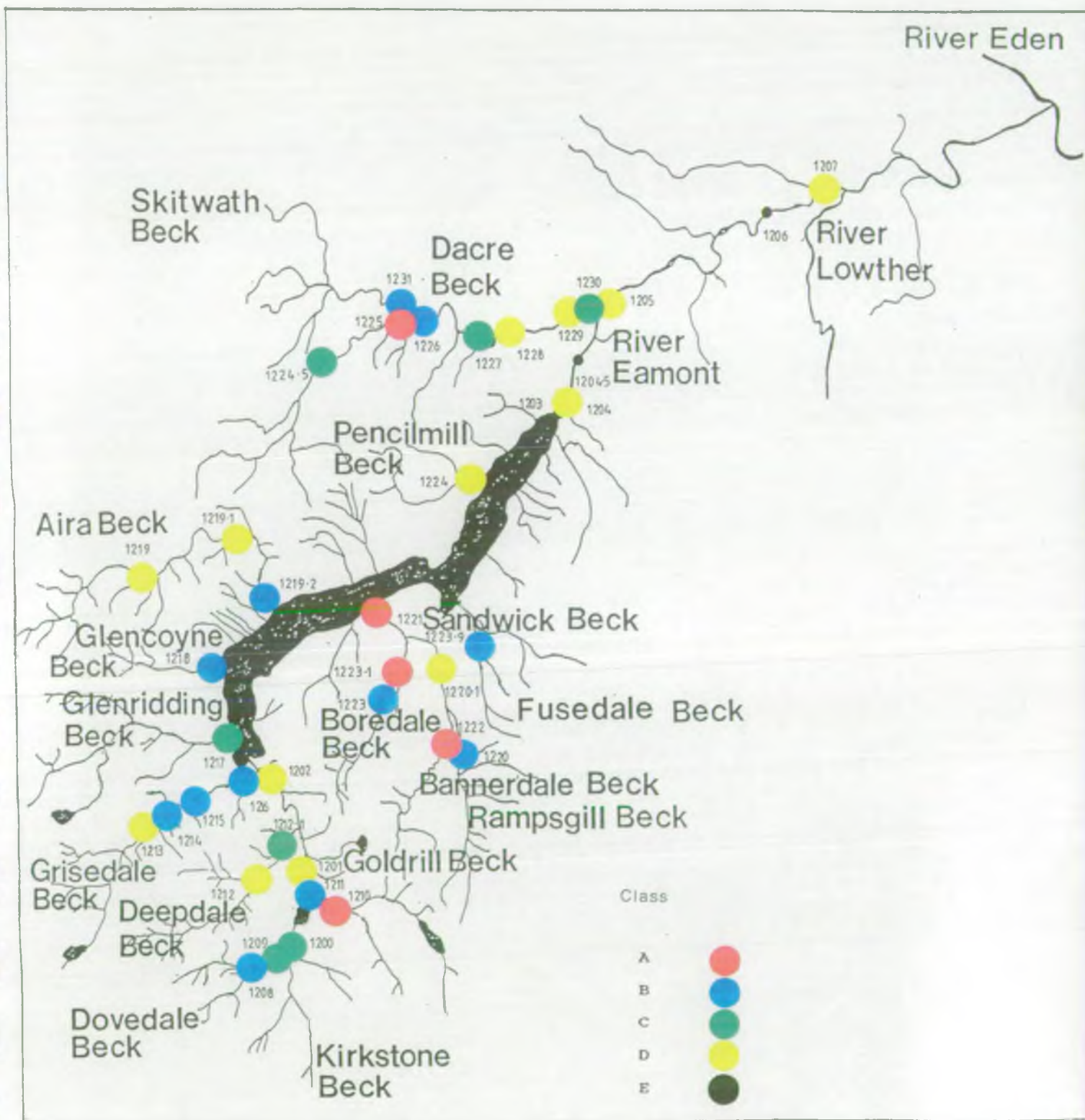
Trout (>0+) Densities In 1993



EAMONT CATCHMENT

FIGURE 6

Total Salmonid Density Class 1993



EAMONT CATCHMENT

FIGURE 7

Stocking Data 1992



EAMONT CATCHMENT

FIGURE 8

Redd Counts 1991



EAMONT CATCHMENT

FIGURE 9

Known Obstacles To Migratory Fish - 1993



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APPENDIX 1

CALCULATION OF ESTIMATED POPULATION DENSITIES

The relationship between densities obtained from single fishings (S.Q.) and multiple fishings (Q) was the subject of an N.R.A. Regional study - it is reported in:-

Farooqi, M. and Aprahamian M. W. 1993.

The calibration of a semi-quantitative Approach to Fish Stock Assessment in the N.W. Region of the N.R.A.

N.R.A. Internal Report: NRA/NW/FTR/93/4

A strong correlation between both methods of sampling was achieved (>80%) in all age classes for salmonids. The appropriate multipliers are shown below.

Age and Species

0+ Salmon	$Q = 2.16 \times SQ$
>0+ Salmon	$Q = 2.36 \times SQ$
0+ Trout	$Q = 1.94 \times SQ$
>0+ Trout	$Q = 1.86 \times SQ$

Where Q = the quantitative result from multiple fishings and SQ = the semi quantitative result from a single fishing.

These multipliers were used in this survey to produce an estimated population density ($N/100m^2$).

APPENDIX 2

Derivation of Total Salmonid Density Class

In order to create a class which related to Total Salmonid Density (ie. all salmon plus all trout) it was necessary to rationalise the abundance categories for the two different age classes, ie. fry and parr (Table 1).

The classes are based on the assumption that 1 in 5, or 20%, of fry survive to become parr (Table 1). Thus, by dividing the total fry density by 5, all densities could be related to the Abundance Class for parr.

An index for Total Salmonid Density was calculated using densities as follows;

$$\text{Index} = 1/5 (\text{Salmon } 0+ + \text{Trout } 0+) + (\text{Salmon } >0+ + \text{Trout } 0+)$$

As this index was derived from both salmon and trout the parr abundance categories have been doubled (Table 3).

Table 3 Classification for Total Salmonid Density Index (N/100m²)

Class

A	>40.00
B	20.01 - 40.00
C	10.01 - 20.00
D	0.01 - 10.00
E	0.00

Thus a site scoring Class B would have a minimum of 20.01 parr per 100m² and a maximum of 40 parr per 100m² or the equivalent fry densities, or a mixture of both.

APPENDIX 3

ESTIMATION OF PRODUCTION BY REACH

Method

Each site was assigned a stream length which extended from a point midway to the next site upstream to a point midway to the next site downstream.

For the most upstream site on a reach the assigned length started 0.5km upstream of the site unless there was a waterfall or other obstruction.

The length was measured down to the confluence or another significant feature for the most downstream site on a reach.

The assigned length was then multiplied by the site width to obtain an area. This area was then multiplied by the densities of each age class to obtain numbers of fish. These numbers were then added together to give production figures for whole streams or reaches.

Assumptions

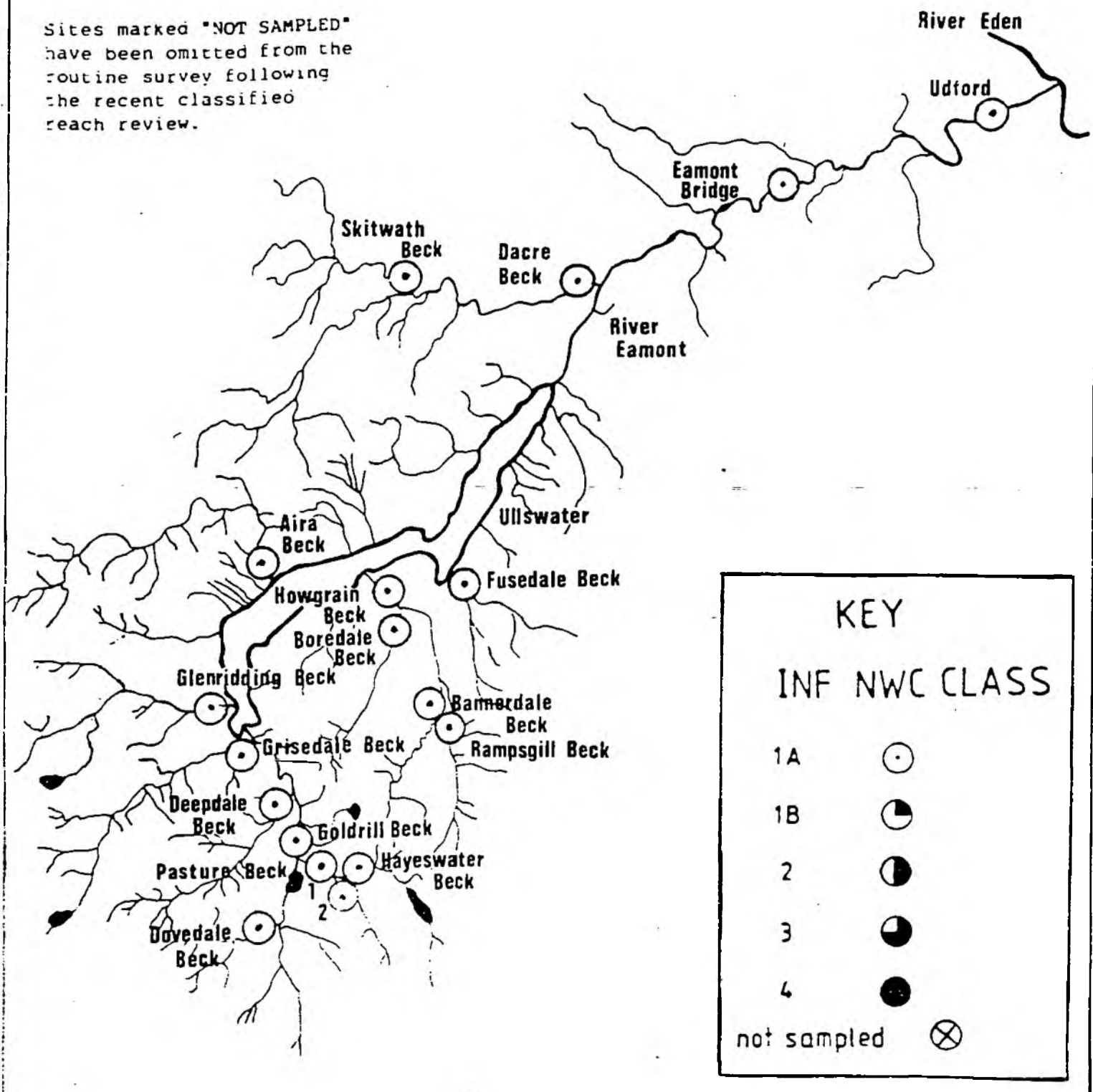
1. That there is no production above the 0.5km upstream of the top site of a reach (not true in most cases).
2. That the whole stream length has the same productivity as the survey sites (this is probably less true for wider streams where riffle habitats are often scarcer than on narrow streams).
3. That there is no production on unsurveyed streams. Such streams are small but could produce significant numbers in total.

EAMONT CATCHMENT SURVEY

APPENDIX 4

Sampling date : 30/6/93 — 3/8/93.

Sites marked "NOT SAMPLED" have been omitted from the routine survey following the recent classified reach review.



SITE DETAILS: EAMONT CATCHMENT 1993

APPENDIX 5

SITE NUMBERS	STREAM NAME	SITE	DATE	NGR	WIDTH (m)	LENGTH (m)	AREA (m2)
1,200.00	KIRKSTONE BECK	AT HARTSOP HALL	05/07/93	NY 399119	4.52	50	226
1,201.00	GOLDRILL BECK	D/S A592	30/06/93	NY 404135	7.59	38	288
1,202.00	GOLDRILL BECK	AT PATTERDALE	30/06/93	NY 395161	7.40	60	444
1,204.00	EAMONT	POOLEY BRIDGE	07/07/93	NY 471245	24.10	54	1,301
1,205.00	EAMONT	DALEMAIN	07/07/93	NY 479267	24.52	51	1,251
1,207.00	EAMONT	U/S OF BROUGHAM CASTLE	07/07/93	NY 533293	18.22	50	911
1,208.00	DOVEDALE BECK	NY394115	05/07/93	NY 394115	3.26	50	163
1,209.00	DOVEDALE BECK	U/S OF FOOTBRIDGE	05/07/93	NY 398118	3.16	56	177
1,210.00	PASTURE BECK	U/S OF HARTSOP	05/07/93	NY 411129	3.81	50	191
1,211.00	PASTURE BECK	D/S A592 BRIDGE	05/06/93	NY 405132	4.01	46	184
1,212.00	DEEPDALE BECK	AT WALLEND	12/10/93	NY 392136	6.95	50	348
1,212.10	DEEPDALE BECK	U/S BRIDGEND	30/06/93	NY 398144	5.46	50	273
1,213.00	GRISEDAL BECK	NY368149	06/07/93	NY 368149	6.87	50	344
1,214.00	GRISEDAL BECK	NY375153	06/07/93	NY 375153	5.80	50	290
1,215.00	GRISEDAL BECK	BRAESTEADS FARM	05/07/93	NY 379156	4.71	48	226
1,216.00	GRISEDAL BECK	D/S OF A592 BRIDGE	06/07/93	NY 394163	5.49	50	275
1,217.00	GLENRIDDING BECK	180M U/S OF LAKE	30/06/93	NY 390171	4.80	50	240
1,218.00	GLENCOYNE BECK	U/S OF (A592) ROAD	30/06/93	NY 386188	2.89	50	145
1,219.00	AIRA BECK	AT DOUTHWAITE HEAD	12/10/93	NY 372207	5.70	52	296
1,219.10	AIRA BECK	AT DOCKRAY	12/10/93	NY 394215	8.03	52	418
1,219.20	AIRA BECK	LYULPHS TOWER	30/06/93	NY 402202	4.53	49	222
1,220.00	RAMPSGILL BECK	THE BUNGALOW	06/07/93	NY 438163	4.21	50	211
1,220.10	HOWGRAIN BECK	AT CHRISTY BRIDGE	12/10/93	NY 433183	5.40	50	270
1,221.00	SANDWICK BECK	SANDWICK	06/07/93	NY 423197	6.25	50	313
1,222.00	BANNERDALE BECK	D/S DALE HEAD	06/07/93	NY 436168	4.49	50	225
1,223.00	BOREDALE BECK	AT BOREDALE HEAD	12/10/93	NY 420170	2.24	52	116
1,223.10	BOREDALE BECK	AT GARTH HEADS	06/07/93	NY 424183	2.43	50	122
1,223.90	FUSEDAL BECK	AT HOWTOWN	12/10/93	NY 445192	2.24	50	112
1,224.00	PENCIL BECK	NR WATERMILLOCK	30/06/93	NY 447227	3.28	56	184
1,224.50	DACRE BECK	AT WALLOWAY	12/10/93	NY 412253	3.71	41	152
1,225.00	DACRE BECK	U/S SKITWATH BECK	29/06/93	NY 435263	3.82	48	183
1,226.00	DACRE BECK	D/S SKITWATH BECK	29/06/93	NY 437264	5.14	52	267
1,227.00	DACRE BECK	U/S BRIDGE END COTTAGE	29/06/93	NY 453261	5.17	50	259
1,228.00	DACRE BECK	AT DACRE LODGE	29/06/93	NY 457262	3.63	51	185
1,229.00	DACRE BECK	AT PARK HOUSE	29/06/93	NY 473266	6.35	52	330
1,230.00	DACRE BECK	AT DALEMAIN	29/06/93	NY 477268	8.90	50	445
1,231.00	SKITWATH BECK	U/S DACRE BECK	29/06/93	NY 435266	4.24	50	212

ESTIMATED SALMONID POPULATION DENSITIES N/100m2 (1992 CALIB)
FOR SITES ON THE EAMONT 1993

APPENDIX 6

Site No	Stream	Site	Salmon		Trout	
			0+	>0+	0+	>0+
1,200.00	KIRKSTONE BECK	AT HARTSOP HALL	0.00	0.00	5.15	16.42
1,201.00	GOLDRILL BECK	D/S A592	15.75	1.63	4.72	0.00
1,202.00	GOLDRILL BECK	AT PATERDALE	0.00	1.06	0.00	0.83
1,204.00	EAMONT	POOLEY BRIDGE	13.95	0.00	17.77	1.43
1,205.00	EAMONT	DALEMAIN	17.43	1.32	0.62	0.00
1,207.00	EAMONT	U/S OF BROUGHAM CASTLE	23.71	2.33	0.21	0.00
1,208.00	DOVEDALE BECK	NY394115	0.00	0.00	32.16	19.35
1,209.00	DOVEDALE BECK	U/S OF FOOTBRIDGE	0.00	0.00	7.67	16.77
1,210.00	PASTURE BECK	U/S OF HARTSOP	13.56	41.98	8.14	12.63
1,211.00	PASTURE BECK	D/S A592 BRIDGE	4.69	15.38	16.89	1.00
1,212.00	DEEPDALE BECK	AT WALLEND	0.00	0.00	6.70	2.13
1,212.10	DEEPDALE BECK	U/S BRIDGEND	9.50	6.91	8.54	2.04
1,213.00	GRISEDAL BECK	NY368149	0.63	0.68	6.21	6.47
1,214.00	GRISEDAL BECK	NY375153	0.00	6.51	11.38	12.80
1,215.00	GRISEDAL BECK	BRAESTEADS FARM	2.87	9.39	18.89	10.67
1,216.00	GRISEDAL BECK	D/S OF A592 BRIDGE	3.93	24.01	12.72	1.35
1,217.00	GLENRIDDING BECK	180M U/S OF LAKE	2.70	3.94	4.04	9.28
1,218.00	GLENCOYNE BECK	U/S OF (A592) ROAD	0.00	4.88	42.85	17.92
1,219.00	AIRA BECK	AT DOUTHWAITE HEAD	0.00	0.00	3.94	7.51
1,219.10	AIRA BECK	AT DOCKRAY	0.00	0.00	1.40	4.43
1,219.20	AIRA BECK	LYULPHS TOWER	0.00	15.94	9.61	12.54
1,220.00	RAMPSGILL BECK	THE BUNGALOW	5.12	8.94	29.46	13.19
1,220.10	HOWGRAIN BECK	AT CHRISTY BRIDGE	0.00	0.87	8.62	2.75
1,221.00	SANDWICK BECK	SANDWICK	4.84	45.21	13.03	14.82
1,222.00	BANNERDALE BECK	D/S DALE HEAD	31.68	34.60	43.15	0.00
1,223.00	BOREDALE BECK	AT BOREDALE HEAD	0.00	0.00	25.11	17.59
1,223.10	BOREDALE BECK	AT GARTH HEADS	0.00	0.00	138.47	22.82
1,223.90	FUSEDAL BECK	AT HOWTOWN	0.00	0.00	41.61	28.16
1,224.00	PENCIL BECK	NR WATERMILLOCK	0.00	0.00	10.54	4.03
1,224.50	DACRE BECK	AT WALLOWAY	5.68	7.76	10.21	6.10
1,225.00	DACRE BECK	U/S SKITWATH BECK	106.22	69.60	3.18	8.11
1,226.00	DACRE BECK	D/S SKITWATH BECK	27.49	16.79	2.91	1.39
1,227.00	DACRE BECK	U/S BRIDGE END COTTAGE	32.53	5.47	0.00	2.15
1,228.00	DACRE BECK	AT DACRE LODGE	4.67	3.82	0.00	4.01
1,229.00	DACRE BECK	AT PARK HOUSE	11.77	5.00	0.58	1.13
1,230.00	DACRE BECK	AT DALEMAIN	37.37	1.06	1.30	1.24
1,231.00	SKITWATH BECK	U/S DACRE BECK	47.88	6.67	15.57	2.63

MINIMUM DENSITIES (n/100m²) OF MAJOR COARSE FISH SPECIES
FOR STREAM SITES IN THE EAMONT CATCHMENT 1993.

APPENDIX 7

Site No	Stream	Site	Eels	Pike	Dace	Perch
1,200.00	KIRKSTONE BECK	AT HARTSOP HALL	1.77	0.00	0.00	0.00
1,201.00	GOLDRILL BECK	D/S A592	2.08	0.00	0.00	0.00
1,202.00	GOLDRILL BECK	AT PATTERDALE	10.59	0.00	0.00	0.00
1,204.00	EAMONT	POOLEY BRIDGE	3.69	0.00	0.00	0.00
1,205.00	EAMONT	DALEMALN	3.68	0.00	0.00	0.00
1,207.00	EAMONT	U/S OF BROUGHAM CAST	11.09	0.00	0.00	0.00
1,208.00	DOVEDALE BECK	NY394115	0.00	0.00	0.00	0.00
1,209.00	DOVEDALE BECK	U/S OF FOOTBRIDGE	3.39	0.00	0.00	0.00
1,210.00	PASTURE BECK	U/S OF HARTSOP	0.52	0.00	0.00	0.00
1,211.00	PASTURE BECK	D/S A592 BRIDGE	3.80	0.00	0.00	0.00
1,212.00	DEEPDALE BECK	AT WALLEND	0.29	0.00	0.00	0.00
1,212.10	DEEPDALE BECK	U/S BRIDGEND	0.37	0.00	0.00	0.00
1,213.00	GRISEDAL BECK	NY368149	0.29	0.00	0.00	0.00
1,214.00	GRISEDAL BECK	NY375153	0.00	0.00	0.00	0.00
1,215.00	GRISEDAL BECK	BRAESTEADS FARM	0.00	0.00	0.00	0.00
1,216.00	GRISEDAL BECK	D/S OF A592 BRIDGE	0.73	0.00	0.00	0.00
1,217.00	GLENRIDDING BECK	180M U/S OF LAKE	2.50	0.00	0.00	0.00
1,218.00	GLENCOYNE BECK	U/S OF (A592) ROAD	0.69	0.00	0.00	0.00
1,219.00	AIRA BECK	AT DOUTHWAITE HEAD	0.00	0.00	0.00	0.00
1,219.10	AIRA BECK	AT DOCKRAY	0.00	0.00	0.00	0.00
1,219.20	AIRA BECK	LYULPHS TOWER	0.90	0.00	0.00	0.00
1,220.00	RAMPGILL BECK	THE BUNGALOW	2.37	0.00	0.00	0.00
1,220.10	HOWGRAIN BECK	AT-CHRISTY BRIDGE	0.74	0.00	0.00	0.00
1,221.00	SANDWICK BECK	SANDWICK	5.75	0.00	0.00	0.00
1,222.00	BANNERDALE BECK	D/S DALE HEAD	3.56	0.00	0.00	0.00
1,223.00	BOREDALE BECK	AT BOREDALE HEAD	0.00	0.00	0.00	0.00
1,223.10	BOREDALE BECK	AT GARTH HEADS	0.00	0.00	0.00	0.00
1,223.90	FUSEDAL BECK	AT HOWTOWN	0.00	0.00	0.00	0.00
1,224.00	PENCIL BECK	NR WATERMILLOCK	2.17	0.00	0.00	0.00
1,224.50	DACRE BECK	AT WALLOWAY	0.00	0.00	0.00	0.00
1,225.00	DACRE BECK	U/S SKITWATH BECK	2.73	0.00	0.00	0.00
1,226.00	DACRE BECK	D/S SKITWATH BECK	2.62	0.00	0.00	0.00
1,227.00	DACRE BECK	U/S BRIDGE END COTTA	0.39	0.00	0.00	0.00
1,228.00	DACRE BECK	AT DACRE LODGE	1.08	0.00	0.00	0.00
1,229.00	DACRE BECK	AT PARK HOUSE	4.55	0.00	0.00	0.00
1,230.00	DACRE BECK	AT DALEMALN	6.52	0.00	0.00	0.00
1,231.00	SKITWATH BECK	U/S DACRE BECK	0.47	0.00	0.00	0.00

MINOR COARSE FISH ABUNDANCES
AT SITES IN THE EAMONT CATCHMENT 1993

APPENDIX 8

Site No	Stream	Site	Stoneloach	Bullhead	Minnow	Stickleback	Lamprey
1,200.00	KIRKSTONE BECK	AT HARTSOP HALL	11-100	11-100	11-100	-	
1,201.00	GOLDRILL BECK	D/S A592	11-100	11-100	11-100	-	
1,202.00	GOLDRILL BECK	AT PATTERNDALE	11-100	11-100	101-1000	-	
1,204.00	EAMONT	POOLEY BRIDGE	11-100	101-1000	101-1000	11-100	
1,205.00	EAMONT	DALEMALN	101-1000	101-1000	101-1000	-	
1,207.00	EAMONT	U/S OF BROUGHAM CASTLE	101-1000	101-1000	11-100	-	
1,208.00	DOVEDALE BECK	NY394115	-	11-100	11-100	-	
1,209.00	DOVEDALE BECK	U/S OF FOOTBRIDGE	-	11-100	11-100	-	
1,210.00	PASTURE BECK	U/S OF HARTSOP	-	-	-	-	
1,211.00	PASTURE BECK	D/S A592 BRIDGE	11-100	11-100	11-100	-	
1,212.00	DEEPDALE BECK	AT WALLEND	0	0	0	0	
1,212.10	DEEPDALE BECK	U/S BRIDGEND	11-100	11-100	11-100	-	
1,213.00	GRISEDAL BECK	NY368149	-	-	-	-	
1,214.00	GRISEDAL BECK	NY375153	-	-	-	-	
1,215.00	GRISEDAL BECK	BRAESTEADS FARM	-	-	-	-	
1,216.00	GRISEDAL BECK	D/S OF A592 BRIDGE	11-100	11-100	11-100	-	
1,217.00	GLENRIDDING BECK	180M U/S OF LAKE	-	11-100	11-100	1-10	
1,218.00	GLENCOYNE BECK	U/S OF (A592) ROAD	-	11-100	11-100	-	
1,219.00	AIRA BECK	AT DOUTHWAITE HEAD	0	0	0	0	
1,219.10	AIRA BECK	AT DOCKRAY	0	0	0	0	
1,219.20	AIRA BECK	LYULPHS TOWER	-	-	-	-	
1,220.00	RAMPSGILL BECK	THE BUNGALOW	1-10	1-10	1-10	-	
1,220.10	HOWGRAIN BECK	AT CHRISTY BRIDGE	0	0	1-10	0	
1,221.00	SANDWICK BECK	SANDWICK	11-100	101-1000	101-1000	-	
1,222.00	BANNERDALE BECK	D/S DALE HEAD	11-100	11-100	101-1000	-	
1,223.00	BOREDALE BECK	AT BOREDALE HEAD	0	0	0	0	
1,223.10	BOREDALE BECK	AT GARTH HEADS	1-10	1-10	1000+	-	
1,223.90	FUSEDAL BECK	AT HOWTOWN	0	0	0	0	
1,224.00	PENCIL BECK	NR WATERMILLOCK	101-1000	11-100	1000+	-	
1,224.50	DACRE BECK	AT WALLOWAY	1-10	0	11-100	1-10	
1,225.00	DACRE BECK	U/S SKITWATH BECK	1-10	1-10	-	-	
1,226.00	DACRE BECK	D/S SKITWATH BECK	101-1000	11-100	-	-	
1,227.00	DACRE BECK	U/S BRIDGE END COTTAGE	101-1000	11-100	11-100	-	
1,228.00	DACRE BECK	AT DACRE LODGE	-	-	-	-	
1,229.00	DACRE BECK	AT PARK HOUSE	101-1000	101-1000	1000+	11-100	
1,230.00	DACRE BECK	AT DALEMALN	101-1000	101-1000	1000+	1-10	
1,231.00	SKITWATH BECK	U/S DACRE BECK	11-100	-	-	11-100	