

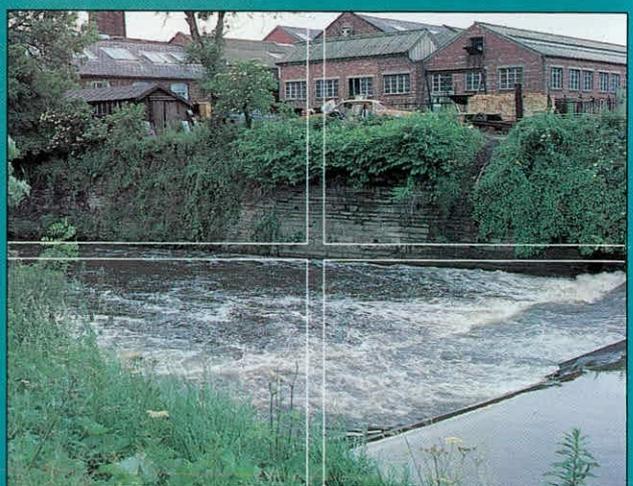
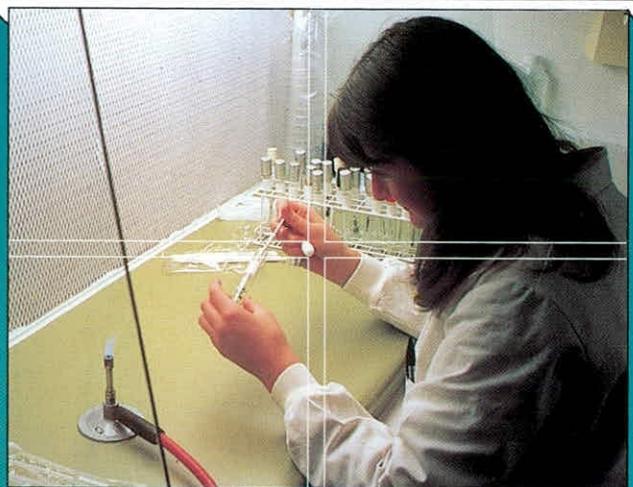
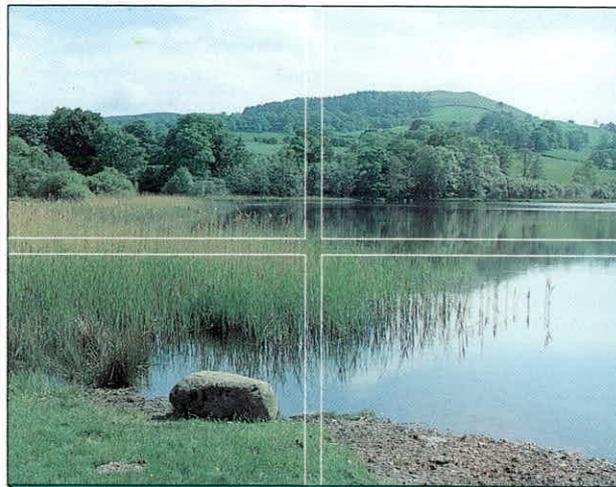


# Acid Waters Monitoring 1997 Report on Fish Studies

W R C Beaumont, LMIFM  
A Pinder

Report to:  
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**Institute of  
Freshwater  
Ecology**

**River Laboratory**  
East Stoke, Wareham  
Dorset BH20 6BB  
United Kingdom

*Telephone* +44 (0)1929 462314  
*Facsimile* +44 (0)1929 462180  
*Email*

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W R C Beaumont, LMIFM  
A Pinder

Project Leader:	W R C Beaumont
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**Centre for  
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Institute of Freshwater Ecology  
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## Introduction

The UK Acid Waters Monitoring Network (UKAWMN) was set up in 1988 on the recommendation of the UK Acid Waters Review Group. It comprises 20 (increased to 22 in 1991) sites throughout England, Wales, Scotland and N. Ireland situated in those parts of the country most susceptible to acidification. Biological and chemical parameters are monitored and collated by several specialist laboratories throughout the country and the network is managed by and administered by ENSIS Ltd at the Environmental Change Research Centre, University College London.

## Objectives

The objective of the network is to provide long-term, high quality chemical and biological data, which in conjunction with data from the existing UK Precipitation Monitoring Network, will facilitate the assessment of trends in surface water acidity.

Data from all sites are collated and analysed yearly and this report details the results from the surveys of the fish populations of the sites for year 10 of the study (1997). Full site descriptions and details of the methodology used are detailed in a separate report (Patrick *et. al.* 1991). Results from all the biological and chemical surveys are produced in an annual report to the Department of the Environment and the Department of the Environment Northern Ireland by ENSIS Ltd. Analysis and interpretation of the biological and chemical data at each site will be presented in five yearly reports, the first of which was published in 1995 (Patrick, Monteith and Jenkins 1995) and the second which will be prepared this year.

## Fish population data analysis: 1997

Fish population surveys of the UK Acid Waters Monitoring sites were carried out between 5/9/97 and 10/10/97. Table 1 gives site details and dates of sampling. Conditions for fishing appeared to be moderate to high at most sites with some sites showing signs of recent spate conditions. At one site (Allt a Mharcaidh) very low flow conditions prior to sampling resulted in few fish being caught in a reach which normally yields a good population. When incorporated into the site estimates this reach biased the site population estimate. It was decided therefore to exclude this reach from the site estimate and calculate the average density for the site from just two reach estimates. In contrast both sites 2 and 10 showed evidence of recent spates in the streams. Two problems with fish weighing arose. At site 14 the balance was blown into the stream and at sites 17 and 18 the fish were only weighed to the nearest gram (rather than the nearest 0.1 g).

Table 2 gives the data from the fish surveys. Population estimates (exact maximum likelihood) are calculated using the IFE "Remove" program (Clarke 1992) Data are stratified into 0+ and >0+ fish and are tabulated for each reach fished (lower, middle and upper). Data are presented for: catch (C); estimated population number (N), the value of 2 times the standard error of the population estimate (SE\*2) which approximately equals the 95% confidence limit of the estimate where  $N > 30$ ; capture efficiencies (P); and fish population densities (D), the value for twice the standard error of the density estimate (SE\*2), chi square values (X2) and a code indicating the status of the data. Codes given are: ME - density value is minimum estimate based upon actual catch; LC - catch low (<30) for accurate population estimate; IV - significant chi square value renders population estimate invalid; and V - valid population estimate. It should be noted that even when

there is a significant chi square value the density estimate is still based upon the estimated population number where it is considered that it is still the best estimate available.

Data are also calculated for the total site (as distinct from reach) and are presented as follows: total site catch (TC); estimated total site population number (TN), calculated by adding the estimated reach population estimates, the value of 2 times the standard error of the population estimate ( $SE*2$ ), calculated from the formula:  $Var(T) = \sqrt{(SE(N_i))^2}$ ; and the mean site density (XD) together with its  $2*SE$  value ( $SE*2$ ). Where fish have been caught in a reach but no population estimate has been possible only total catch (TC) and mean density data (XD) are shown. The data for the mean density are calculated from the reaches where population data are available and minimum population density estimates, based on actual catch, where population data are not available.

Population data have been stratified into 0-group and >0-group fish. As a result of this many of the population estimates are below the limits recommended for valid estimation of population numbers (Bohlin 1982) and error estimates may be imprecise.

Of the 21 sites fished all had fish present however only 15 sites had fish present in every reach.

Population estimates were not possible for a total of 21 reaches, due to either insufficient fish present or aberrant catch characteristics, in these case minimum densities based upon actual catch have been calculated.

Of the 71 population density estimates, only 8 produced valid population estimates with over 30 fish present. Nine produced invalid estimates, due to inconsistent effort between fishings. For one of these sites (River Ben Crom) aberrant catch numbers resulted, despite extra fishings, in a very large population estimate. This estimate was felt to be very inaccurate and a minimum density estimate (based upon actual catch) was used instead. For the middle reach of Coneyglen Burn a malfunction in the electric fishing gear also resulted in an aberrant catch distribution (and thus an invalid population estimate) however it was felt that this estimate was still the most accurate available and was thus used to calculate the site density. It is thought that the invalid estimate for the lower reach of Narrator Brook was caused by overhanging vegetation being cleared from the stream during, rather than prior to, the first fishing. As with site 22, however, it was considered that this, invalid, estimate is still the most accurate assessment of the population available. The rest (54 estimates) whilst producing valid estimates had below 30 fish present and error estimates should therefore be regarded as indicative rather than absolute.

Salmon data are presented in Table 3, data were not stratified into different age groups.

Where it was possible to calculate population data, capture efficiencies for trout ranged from 12% to 88%. Twelve estimates had efficiencies below 50% and seven estimates had efficiencies below 40%, the standard error of these estimates are likely to be large.

For salmon, no estimates had a capture efficiency below 60%.

Figure 1 shows trout densities at each site. Densities are for all age groups combined. Where trout were found to be present, site mean densities ranged from 0.004 to 1.063 fish per square metre. Note that where densities are greater than zero but less than 0.01 figure 1 shows a value of 0.00.

Table 3 and Figure 2 show age stratified Trout data at each site since 1988. Data are expressed as trout per 100m<sup>2</sup> (NF indicates the site was not fished that year). Note that sites 17 and 18 have changed during the course of the project. Full analysis of these data will be incorporated into the ten year interpretative report.

## **STREAM SALMONID HABITAT EVALUATION**

HABSCORE data have been recorded for all sites and the data will be incorporated into the ten year analysis of results. A comparison between the results obtained using HABSCORE III and HABSCORE V has been carried out. HABSCORE III was designed for use in Welsh rivers and was not intended to be UK wide in its estimations. HABSCORE V however is designed to be applicable to rivers in England and Wales and may therefore give more precise information for the UKAWMN rivers and streams (Scottish rivers however are not covered). Another advantage of HABSCORE V over HABSCORE III is that the HABSCORE V records sheets are better documented, more user friendly and less equivocal than the HABSCORE III sheets. It was considered however that unless real benefits could be shown to be accrued by using the newer version then, for consistency, it would be best to stay with the older version. When comparing the two versions the HQS values were compared between programme versions. The agreement, or otherwise, with the observed densities of trout found at the sites was also noted. It was accepted however that the sites may not be considered as pristine and therefore observed densities may be lower than the predicted HQS values due to the effects of acidification etc. Both versions of the programme produce very wide 95% confidence limits to the HQS predictions however for this study only the mean HQS values were considered.

Data from the 1996 surveys from the upper reaches of six sites were chosen (Coire nan Arr, Loch Chon, Scoat Tarn, Llyn Llagi, Old Lodge and Narrator Brook) and results compared between the two versions on the programme. It was noted that as the first two sites are in Scotland the programme is not designed to include them in its data set. Data entered into the HABSCORE V program was derived from the HABSCORE III information recorded annually for each of the sites. Some informed guesswork and extrapolation was required for some of the inputs but these were done in a consistent manner and, where possible, kept to a minimum. The results of the comparison are shown in figure 3.

There was a marked variation in agreement between predicted HQS values derived from the two versions of the programme. For 0+ data two of the sites (Llyn Llagi and Narrator Brook) showed close agreement whereas the other sites showed up to 5 fold variation. For >0+ data the closest agreement between HQS data still had a >2 fold difference and one site (Llyn Llagi) had an 11 fold variation between data values.

Agreement with observed densities was also very variable. For the 0+ trout HABSCORE V more closely predicted the observed densities for four of the six sites. For the >0+ trout HABSCORE V again more closely predicted the observed densities for four of the six sites, but for different sites.

Overall the comparison exercise did not indicate that any marked benefit would be gained from changing to the newer HABSCORE V programme. The benefits of staying with the same system, thereby enabling direct comparisons between years, outweighing the improved recording system and wider geographic applicability of HABSCORE V. It should be noted

that the comparison carried out involved very few sites and was using data derived from the earlier HABSCORE III sheets, no implications are made therefore as to the applicability or accuracy of the HABSCORE V programme.

#### **1996 Data Report: ERRATUM**

Density data for sites 8 and 9 were omitted from the 1996 report. The data have been incorporated into the data set presented in this report.

## References

Bohlin T. (1982) The validity of the removal estimate for small populations - Consequences for electrofishing practice. *Rep. Inst. Freshwat. Res. Drottningholm*. 60, 15-18.

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**TABLE 1**

Contractor and Contact name	Site	Date Sampled	Flow Conditions	Comments
DAFS P Collen	1. Loch Coire nan Arr outflow	19-9-97	Moderate/High	Heavy spate one week prior to fishing.
"	2. Allt a Mharcaidh outflow	5-9-97	Low	Top reach recently dry.
"	3. Allt na Coire nan con (Pollock Burn)	25-9-97	Low	
"	4. Lochnagar outflow	19-9-97	Moderate	
"	5. Loch Chon outflow	1 to 10-9-97	Moderate/High	
"	6. Loch Tinker outflow	12-9-96	Moderate	
"	7. Round loch of Glenhead outflow	23-9-96	Moderate	
"	8. Loch Grannoch outflow	8-10-97	Medium	
"	9. Dargal Lane	7-10-97	Medium	
IFE J Fletcher	10. Scoat Tarn outflow	2-10-97	OK	Evidence of recent spate
"	11. Burnmoor Tarn outflow	3-10-97	OK	
NRA NW-Region	12. River Etherow	Not Fished		
QMW A Hildrew	13. Old Lodge	9-10-97	Medium	
Plymouth Univ P Reay	14. Narrator Brook	30-9-97	Medium	
NRA Welsh Reg J Bray	15. Llyn Llagi outflow	23-9-97	Average/Low	
"	16. Llyn Cwm Mynach outflow	30-9-97	Low	
NRA Welsh Reg D Mee	17. Afon Hafren	18-9-97	Average/High	
"	18. Afon Gwy	17-9-97	Average/High	
DANI I Moffett	19. Beaghs Burn	22-9-97	Moderate	
"	20. Bencrom River	23-9-97	Moderate	
"	21. Blue loch outflow	25-9-97	Moderate	
"	22. Conyglan Burn	24-9-97	Moderate	Backpack malfunction

TABLE 2

TROUT		LOWER REACH									
Site No	Name	AGE	C	N	SE*2	P	D	SE*2	X2	CODE	
1	Coire nan arr	0+	7	7	0.00	0.88	0.018	0.00	0.17	LC	
		>0+	15	15	0.00	0.65	0.040	0.00	0.73	LC	
2	Allt a Mharcaidh	0+	95	106	12.27	0.53	0.746	0.09	0.03	V	
		>0+	25	27	4.33	0.56	0.190	0.03	0.43	LC	
3	Coire nan Con	0+	11				0.038			ME	
		>0+	9	9	0.00	0.75	0.031	0.00	1.53	LC	
4	Lochnagar	0+	7	8	3.02	0.44	0.093	0.04	2.75	LC	
		>0+	27	27	0.00	0.73	0.314	0.00	0.33	LC	
5	Water of Chon	0+	80	101	24.08	0.40	0.322	0.08	0.92	V	
		>0+	8	10	5.42	0.38	0.032	0.02	0.55	LC	
6	Loch Tinker	0+	1				0.011			ME	
		>0+	0				0.000				
7	Round loch of Glenhead	0+	2				0.030			ME	
		>0+	4				0.061			ME	
8	Loch Grannoch	0+	0				0.000				
		>0+	1				0.015			ME	
9	Dargal Lane	0+	18	19	2.71	0.58	0.114	0.02	0.66	LC	
		>0+	10	10	0.00	0.83	0.060	0.00	0.51	LC	
10	Scoat Burn	0+	0				0.000				
		>0+	3	3	0.00	0.75	0.020	0.00	0.51	LC	
11	Burnmoor Tarn	0+	0				0.000				
		>0+	0				0.000				
12	Etherow	0+	Not Fished								
		>0+									
13	Old Lodge	0+	2				0.016			ME	
		>0+	7	7	0.00	0.70	0.055	0.00	2.20	LC	
14	Narrator Brook	0+	3				0.055			ME	
		>0+	28	28	18.85	0.31	0.517	0.35	8.74	LC/IV	
15	Llyn Llagi	0+	24	24	0.00	0.80	0.166	0.00	2.89	LC	
		>0+	8	8	0.00	0.67	0.055	0.00	3.70	LC	
16	Llyn Cwm Mynach	0+	18	19	2.71	0.58	0.109	0.02	9.01	LC/IV	
		>0+	12	12	0.00	0.86	0.069	0.00	0.41	LC	
17	Afon Hafren	0+	3				0.015			ME	
		>0+	12	12	0.00	0.75	0.062	0.00	2.03	LC	
18	Afon Gwy	0+	1				0.003			ME	
		>0+	5	5	0.00	0.83	0.037	0.00	0.26	LC	
19	Beagh's Burn	0+	2	2	0.00	0.67	0.014	0.00	0.93	LC	
		>0+	4	4	0.00	0.80	0.028	0.00	0.34	LC	
20	River Bencrom	0+	9				0.043			ME	
		>0+	4	4	0.00	0.80	0.019	0	0.37	LC	
21	Blue Lough	0+	0				0.000				
		>0+	0				0.000				
22	Conyglan Burn	0+	32	32	4.02	0.57	0.141	0.02	0.34	V	
		>0+	6	6	0.00	0.60	0.026	0.00	5.84	LC/IV	

TABLE 2

	TROUT		MIDDLE REACH							
Site No	Name	AGE	C	N	SE*2	P	D	SE*2	X2	CODE
1	Coire nan arr	0+	17	17	0.00	0.71	0.031	0.00	0.72	LC
		>0+	15	16	2.77	0.56	0.029	0.01	1.11	LC
2	Allt a Mharcaidh	0+	190	200	9.36	0.63	0.949	0.04	0.26	V
		>0+	49	51	3.74	0.63	0.242	0.02	0.21	V
3	Coire nan Con	0+	5				0.025			ME
		>0+	2				0.010			ME
4	Lochnagar	0+	17	17	0.00	0.65	0.187	0.00	0.79	LC
		>0+	9	9	0.00	0.64	0.099	0.00	0.62	LC
5	Water of Chon	0+	166	184	15.50	0.54	0.489	0.04	7.38	IV
		>0+	4	4	0.00	0.67	0.011	0.00	2.60	LC
6	Loch Tinker	0+	0				0.000			
		>0+	0				0.000			
7	Round loch of Glenhead	0+	2				0.028			ME
		>0+	1				0.014			ME
8	Loch Grannoch	0+	0				0.000			
		>0+	0				0.000			
9	Dargal Lane	0+	11	13	2.84	0.52	0.086	0.02	1.84	LC
		>0+	5	5	0.00	0.71	0.033	0.00	1.32	LC
10	Scoat Burn	0+	0				0.000			
		>0+	0				0.000			
11	Burnmoor Tam	0+	0				0.000			
		>0+	0				0.000			
12	Etherow	0+	Not Fished							
		>0+								
13	Old Lodge	0+	0				0.000			
		>0+	2				0.012			ME
14	Narrator Brook	0+	5	5	0.00	0.56	0.038	0.00	1.06	LC
		>0+	28	32	7.36	0.48	0.246	0.06	0.19	LC
15	Llyn Llagi	0+	10	10	0.00	0.77	0.075	0.00	1.32	LC
		>0+	21	21	0.00	0.75	0.158	0.00	0.32	LC
16	Llyn Cwm Mynach	0+	14	14	0.00	0.88	0.133	0.00	0.34	LC
		>0+	7	7	0.00	0.70	0.067	0.00	0.86	LC
17	Afon Hafren	0+	0				0.000			
		>0+	9	9	0.00	0.69	0.064	0.00	0.30	LC
18	Afon Gwy	0+	1				0.005			ME
		>0+	14	15	2.71	0.44	0.076	0.01	1.98	LC
19	Beagh's Burn	0+	0				0.000			
		>0+	4	4	0.00	0.80	0.028	0.00	0.34	LC
20	River Bencrom	0+	4	4	0.00	0.50	0.018	0.00	5.75	LC/IV
		>0+	21	21	0.00	0.78	0.094	0.00	5.88	LC/IV
21	Blue Lough	0+	0				0.000			
		>0+	1				0.011			ME
22	Conyglan Burn	0+	85	117	35.09	0.15	0.482	0.15	23.16	IV
		>0+	20	20	0.00	0.39	0.082	0.00	12.40	LC/IV

TABLE 2

Site No	TROUT	AGE	UPPER REACH							CODE
	Name		C	N	SE*2	P	D	SE*2	X2	
1	Coire nan arr	0+	22	22	0.00	0.69	0.043	0.00	0.61	LC
		>0+	13	18	11.73	0.33	0.035	0.02	0.92	LC
2	Allt a Mharcaidh	0+	0				0.000			
		>0+	1				0.007			ME
3	Coire nan Con	0+	1				0.006			ME
		>0+	10	10	0.00	0.12	0.059	0.00	0.30	LC
4	Lochnagar	0+	12	12	0.00	0.86	0.138	0.00	0.41	LC
		>0+	7	7	0.00	0.88	0.080	0.00	0.17	LC
5	Water of Chon	0+	80	96	18.19	0.44	0.376	0.07	0.29	V
		>0+	16	17	2.79	0.57	0.067	0.01	8.16	LC/IV
6	Loch Tinker	0+	0				0.000			
		>0+	0				0.000			
7	Round loch of Glenhead	0+	1				0.025			ME
		>0+	0				0.000			
8	Loch Grannoch	0+	0				0.000			
		>0+	0				0.000			
9	Dargal Lane	0+	9	9	0.00	0.75	0.047	0.00	1.53	LC
		>0+	7	7	0.00	0.70	0.037	0.00	0.86	LC
10	Scoat Burn	0+	0				0.000			
		>0+	0				0.000			
11	Burnmoor Tarn	0+	0				0.000			
		>0+	6	6	0.00	0.60	0.027	0.00	0.63	LC
12	Etherow	0+	Not Fished							
		>0+								
13	Old Lodge	0+	0				0.000			
		>0+	0				0.000			
14	Narrator Brook	0+	24	36	23.34	0.30	0.209	0.17	3.65	LC
		>0+	36	42	9.97	0.47	0.313	0.07	0.81	V
15	Llyn Llagi	0+	4	4	0.00	0.80	0.030	0.00	0.34	LC
		>0+	15	15	0.00	0.79	0.113	0.00	1.50	LC
16	Llyn Cwm Mynach	0+	13	14	2.87	0.54	0.130	0.03	0.23	LC
		>0+	10	10	0.00	0.67	0.093	0.00	0.43	LC
17	Afon Hafren	0+	2				0.015			ME
		>0+	3	3	0.00	0.75	0.022	0.00	0.51	LC
18	Afon Gwy	0+	0				0.000			
		>0+	12	14	4.97	0.50	0.073	0.03	0.93	LC
19	Beagh's Burn	0+	0				0.000			
		>0+	3	3	0.00	0.75	0.021	0.00	0.51	LC
20	River Bencrom	0+	6	6	0.00	0.54	0.031	0.00	2.19	LC
		>0+	14	14	0.00	0.67	0.072	0.00	0.91	LC
21	Blue Lough	0+	0				0.000			
		>0+	0				0.000			
22	Conyglan Burn	0+	38	38	0.00	0.78	0.174	0.00	1.09	V
		>0+	3	3	0.00	0.75	0.014	0.00	0.51	LC

TABLE 2

Site No	TROUT Name	AGE	SITE TOTAL					
			TC	TN	SE*2	XD	SE*2	
1	Coire nan arr	0+	46	-	-	0.031	0.00	
		>0+	43	49	4.02	0.035	0.01	
2	Allt a Mharcaidh	0+	285	306	5.14	0.848	0.03	Note. Only two reaches used for density.
		>0+	75	78	1.91	0.216	0.01	
3	Coire nan Con	0+	17	-	-	0.023	-	
		>0+	21	19	0.00	0.033	0.00	
4	Lochnagar	0+	36	37	1.01	0.139	0.01	
		>0+	43	43	0.00	0.164	0.00	
5	Water of Chon	0+	326	381	11.31	0.396	0.04	
		>0+	28	31	2.03	0.037	0.01	
6	Loch Tinker	0+	1	-	-	0.004	-	
		>0+	0	-	-	0.000	-	
7	Round loch of Glenhead	0+	5	-	-	0.028	-	
		>0+	5	-	-	0.025	-	
8	Loch Grannoch	0+	0	-	-	0.000	-	
		>0+	1	-	-	0.005	-	
9	Dargal Lane	0+	38	41	1.31	0.082	0.01	
		>0+	22	22	0.00	0.043	0.00	
10	Scoat Burn	0+	0	-	-	0.000	-	
		>0+	3	-	-	0.007	-	
11	Burnmoor Tarn	0+	0	-	-	0.000	-	
		>0+	6	6	0.00	0.009	0.00	
12	Etherow	0+	Not Fished					
		>0+	-	-	-	-	-	
13	Old Lodge	0+	2	-	-	0.005	-	
		>0+	9	-	-	0.022	-	
14	Narrator Brook	0+	32	-	-	0.101	-	
		>0+	92	102	7.52	0.359	0.12	
15	Llyn Llagi	0+	38	38	0.00	0.090	0.00	
		>0+	44	44	0.00	0.109	0.00	
16	Llyn Cwm Mynach	0+	45	47	1.32	0.124	0.01	
		>0+	29	29	0.00	0.076	0.00	
17	Afon Hafren	0+	5	-	-	0.010	-	
		>0+	24	24	0.00	0.049	0.00	
18	Afon Gwy	0+	2	-	-	0.003	-	
		>0+	31	34	1.89	0.062	0.01	
19	Beagh's Burn	0+	2	-	-	0.005	-	
		>0+	11	11	0.00	0.026	0.00	
20	River Bencrom	0+	19	-	-	0.031	-	
		>0+	39	39	0.00	0.062	0.00	
21	Blue Lough	0+	0	-	-	0.000	-	
		>0+	1	-	-	0.004	-	
22	Conyglan Burn	0+	155	187	11.77	0.266	0.05	
		>0+	29	29	0.00	0.041	0.00	

TABLE 3

	SALMON	LOWER REACH							
Site No	Name	C	N	SE*2	P	D	SE*2	X2	CODE
2	Allt a Mharcaidh	70	72	3.565	0.667	0.507	0.025	0.17	V
3	Coire nan Con	179	185	6.57	0.67	0.643	0.02	8.55	IV

TABLE 3

	SALMON	MIDDLE REACH							
Site No	Name	C	N	SE*2	P	D	SE*2	X2	CODE
2	Allt a Mharcaidh	86	91	6.70	0.61	0.432	0.03	0.42	V
3	Coire nan Con	148	158	10.01	0.60	0.807	0.05	2.59	V

TABLE 3

	SALMON	UPPER REACH							
Site No	Name	C	N	SE*2	P	D	SE*2	X2	CODE
2	Allt a Mharcaidh	0				0.000			
3	Coire nan Con	124	131	7.96	0.62	0.777	0.05	3.13	V

TABLE 3

	SALMON	SITE TOTAL					
Site No	Name	TC	TN	SEx2	XD	SEx2	
2	Allt a Mharcaidh	156	163	5.93	0.470	0.03	Note. Only two reaches used for density..
3	Coire nan Con	451	474	4.79	0.742	0.02	

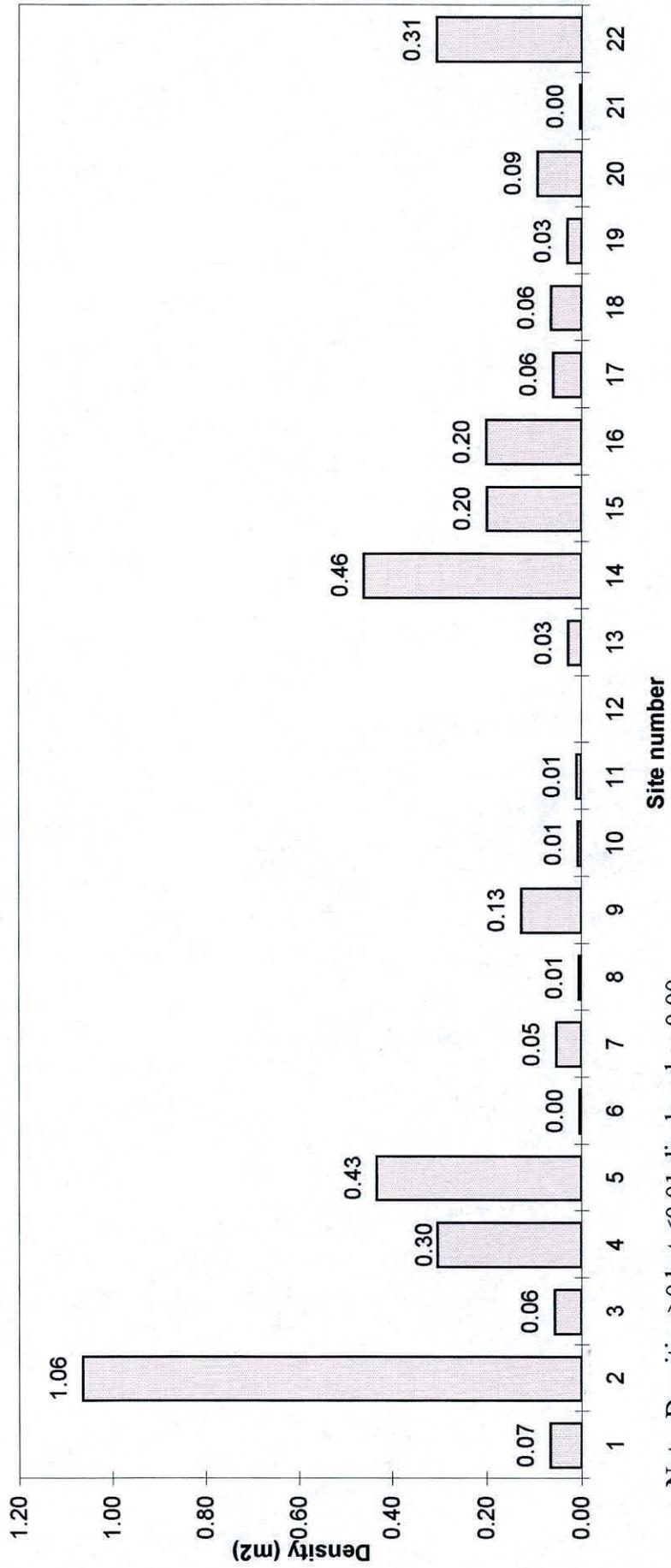
Table 4

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Site 1	MEAN SITE DENSITY		22.00	23.00	51.67	7.33	13.67	9.40	8.57	14.00	6.53
	DENSITY 0+		12.07	10.17	38.73	1.03	5.63	2.40	4.10	0.70	3.07
	DENSITY >0+		10.27	13.50	10.83	6.70	8.17	7.00	4.40	13.30	3.47
Site 2	MEAN SITE DENSITY	32.00	30.00	70.00	157.00	47.67	38.00	65.10	36.00	109.57	106.35
	DENSITY 0+	26.83	23.27	62.17	139.20	35.07	22.67	49.50	31.60	96.27	84.75
	DENSITY >0+	4.63	6.23	7.37	9.37	15.13	14.93	15.60	4.40	13.30	21.60
Site 3	MEAN SITE DENSITY	9.33	7.67	19.33	33.33	4.67	3.67	10.00	23.00	16.00	5.63
	DENSITY 0+	7.20	3.93	14.63	29.20	3.33	2.77	8.80	16.30	9.30	2.30
	DENSITY >0+	2.07	4.07	4.20	7.43	1.33	0.54	1.20	6.70	6.70	3.33
Site 4	MEAN SITE DENSITY		63.33	103.67	105.00	84.33	61.67	70.00	92.57	72.17	30.37
	DENSITY 0+		46.67	38.10	40.77	62.67	26.03	46.80	61.60	32.80	13.93
	DENSITY >0+		16.43	56.30	59.97	22.43	24.20	23.20	30.90	39.37	16.43
Site 5	MEAN SITE DENSITY		24.67	24.00	64.00	28.67	27.00	26.60	42.43	31.43	43.23
	DENSITY 0+		18.50	19.07	60.90	21.97	21.10	25.70	38.50	26.27	39.57
	DENSITY >0+		6.00	4.33	2.27	8.23	5.97	0.90	3.90	5.17	3.67
Site 6	MEAN SITE DENSITY		2.33	3.00	1.33	0.33	1.33	0.70	0.30	0.01	0.36
	DENSITY 0+		0.87	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.36
	DENSITY >0+		2.17	3.30	0.37	0.73	1.33	0.70	0.30	0.00	0.00
Site 7	MEAN SITE DENSITY		3.00	6.00	8.00	3.00	2.00	5.70	6.77	3.00	5.28
	DENSITY 0+		2.57	4.73	6.50	1.63	0.00	1.80	1.50	2.00	2.78
	DENSITY >0+		1.40	0.93	1.37	1.40	2.00	3.90	5.20	1.00	2.50
Site 8	MEAN SITE DENSITY		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.50
	DENSITY 0+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DENSITY >0+		0.10	0.17	0.00	0.00	0.00	0.00	0.00	0.27	0.50
Site 9	MEAN SITE DENSITY	12.67	23.67	5.00	20.33	13.00	11.00	6.60	30.87	12.23	12.57
	DENSITY 0+	7.13	12.87	1.90	12.50	0.37	0.91	1.60	11.30	2.30	8.23
	DENSITY >0+	5.00	10.73	3.00	7.40	12.67	10.00	5.00	19.60	10.00	4.33
Site 10	MEAN SITE DENSITY		0.93	1.27	0.60	1.67	1.00	2.10	1.57	1.00	0.67
	DENSITY 0+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DENSITY >0+		0.93	1.27	1.17	1.67	1.00	2.10	1.57	1.00	0.67
Site 11	MEAN SITE DENSITY		1.33	1.67	1.33	0.30	0.33	0.70	2.87	1.60	0.90
	DENSITY 0+		0.23	0.50	0.60	0.00	0.00	0.00	1.40	0.00	0.00
	DENSITY >0+		1.17	1.20	0.83	0.30	0.33	0.70	1.40	1.60	0.90
Site 12	MEAN SITE DENSITY										
	DENSITY 0+										
	DENSITY >0+										
Site 13	MEAN SITE DENSITY		0.87	0.27	0.23	5.67	2.67	2.90	9.83	5.20	2.75
	DENSITY 0+		0.00	0.00	0.00	6.03	1.62	0.20	3.60	0.00	0.52
	DENSITY >0+		0.87	0.27	0.27	0.00	1.07	2.70	6.20	5.20	2.23
Site 14	MEAN SITE DENSITY	53.00	83.00	64.33	55.00	67.67	43.33	73.00	84.80	73.73	45.93
	DENSITY 0+	13.77	21.07	14.70	24.97	51.43	15.10	41.80	50.60	32.10	10.07
	DENSITY >0+	38.20	60.83	48.20	29.50	31.77	30.00	31.10	34.20	41.63	35.87
Site 15	MEAN SITE DENSITY		26.33	23.67	9.33	22.33	17.33	19.00	10.77	10.60	19.90
	DENSITY 0+		22.00	16.37	3.27	17.50	10.40	8.10	1.60	6.93	9.03
	DENSITY >0+		5.20	7.57	5.87	3.67	7.00	10.80	9.20	3.67	10.87
Site 16	MEAN SITE DENSITY		34.33	21.03	22.80	20.13	25.00	26.50	35.07	43.13	20.03
	DENSITY 0+		22.53	15.87	17.67	13.30	16.43	14.80	26.00	30.17	12.40
	DENSITY >0+		11.80	5.17	5.23	6.83	7.20	11.70	9.10	12.97	7.63
Site 17	MEAN SITE DENSITY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.20	1.83	5.93
	DENSITY 0+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	1.20	1.00
	DENSITY >0+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.40	0.63	4.93
Site 18	MEAN SITE DENSITY				0.00	0.00	6.00	2.80	4.13	5.57	6.48
	DENSITY 0+				0.13	0.30	3.90	0.80	0.70	5.17	0.28
	DENSITY >0+				2.07	2.83	1.81	1.90	3.50	0.40	6.20
Site 19	MEAN SITE DENSITY	0.00	5.20	3.00	2.00	0.83	2.00	1.30	2.30	5.60	3.03
	DENSITY 0+	0.00	2.53	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.47
	DENSITY >0+	1.67	2.53	2.83	2.53	0.83	2.00	1.30	2.30	5.60	2.83
Site 20	MEAN SITE DENSITY	5.40	14.00	10.33	8.33	4.00	6.67	4.90	7.53	6.63	9.23
	DENSITY 0+	1.60	5.07	2.53	3.23	1.87	2.89	1.80	6.20	0.50	2.90
	DENSITY >0+	3.80	8.87	6.53	5.30	2.23	3.93	3.10	1.30	6.13	6.17
Site 21	MEAN SITE DENSITY			1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37
	DENSITY 0+			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DENSITY >0+			0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.37
Site 22	MEAN SITE DENSITY	0.00	0.00	19.00	9.67	3.33	11.93	24.60	12.60	14.44	30.63
	DENSITY 0+	0.00	0.00	14.70	4.07	1.13	11.73	18.40	3.70	10.54	26.57
	DENSITY >0+	0.00	0.00	4.40	5.33	2.30	0.25	6.10	8.90	3.90	4.07



Figure 1.

**Mean trout densities (all ages) at each site. 1997**



Note: Densities >0 but <0.01 displayed as 0.00.



Figure 2:

Mean Site density of Trout / 100m<sup>2</sup>

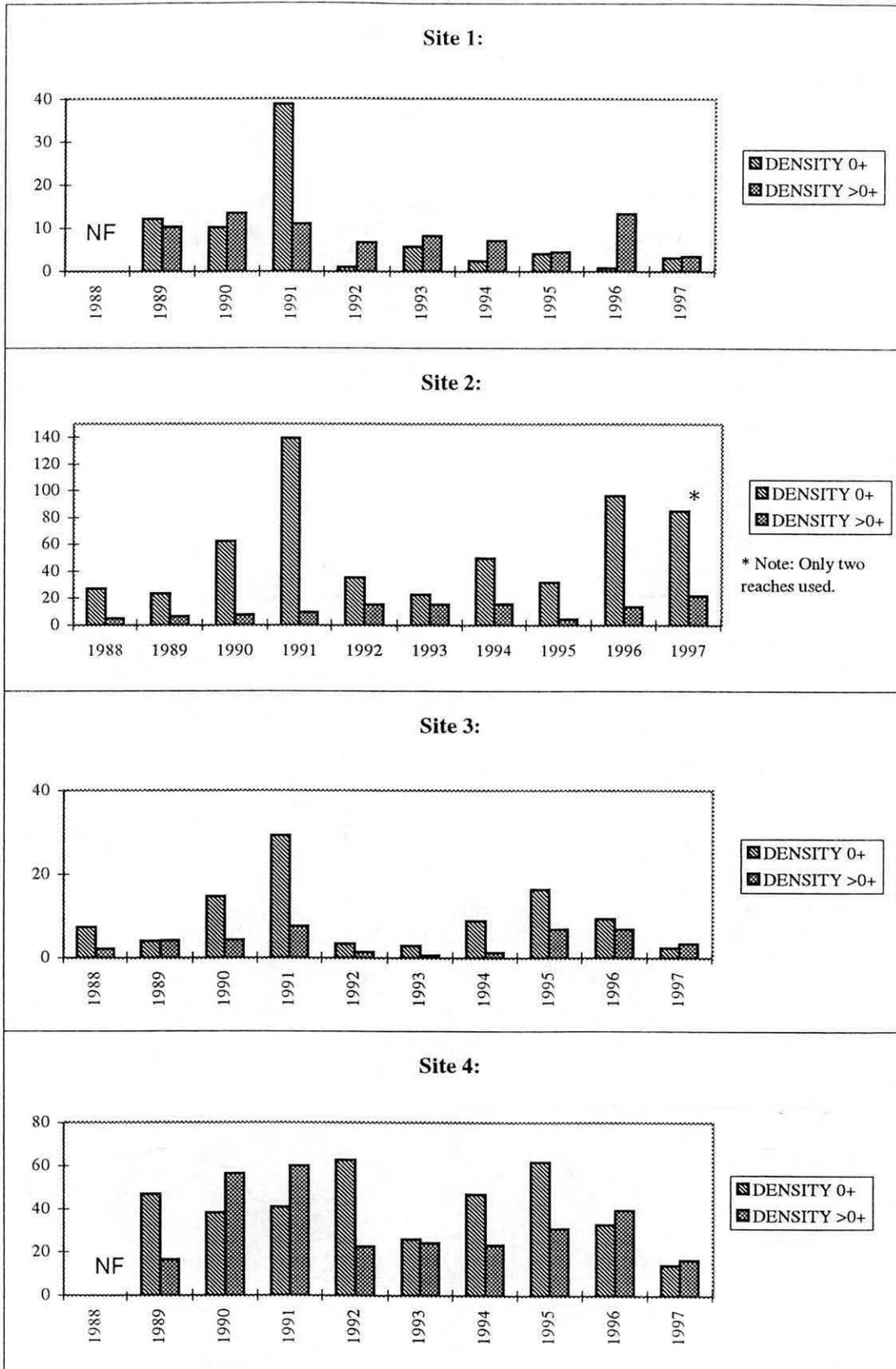


Figure 2:

Mean Site density of Trout / 100m<sup>2</sup>

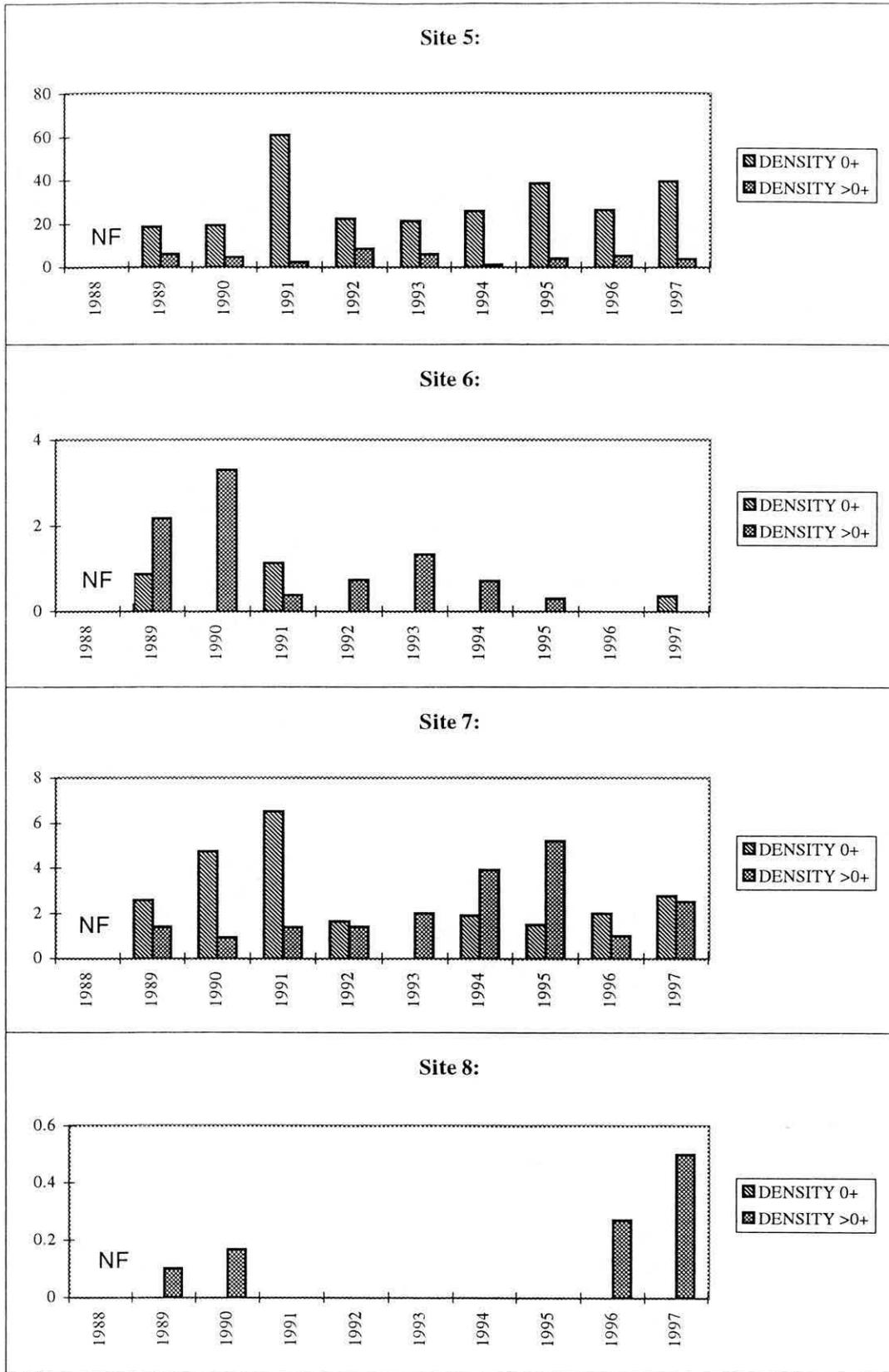


Figure 2:

Mean Site density of Trout / 100m<sup>2</sup>

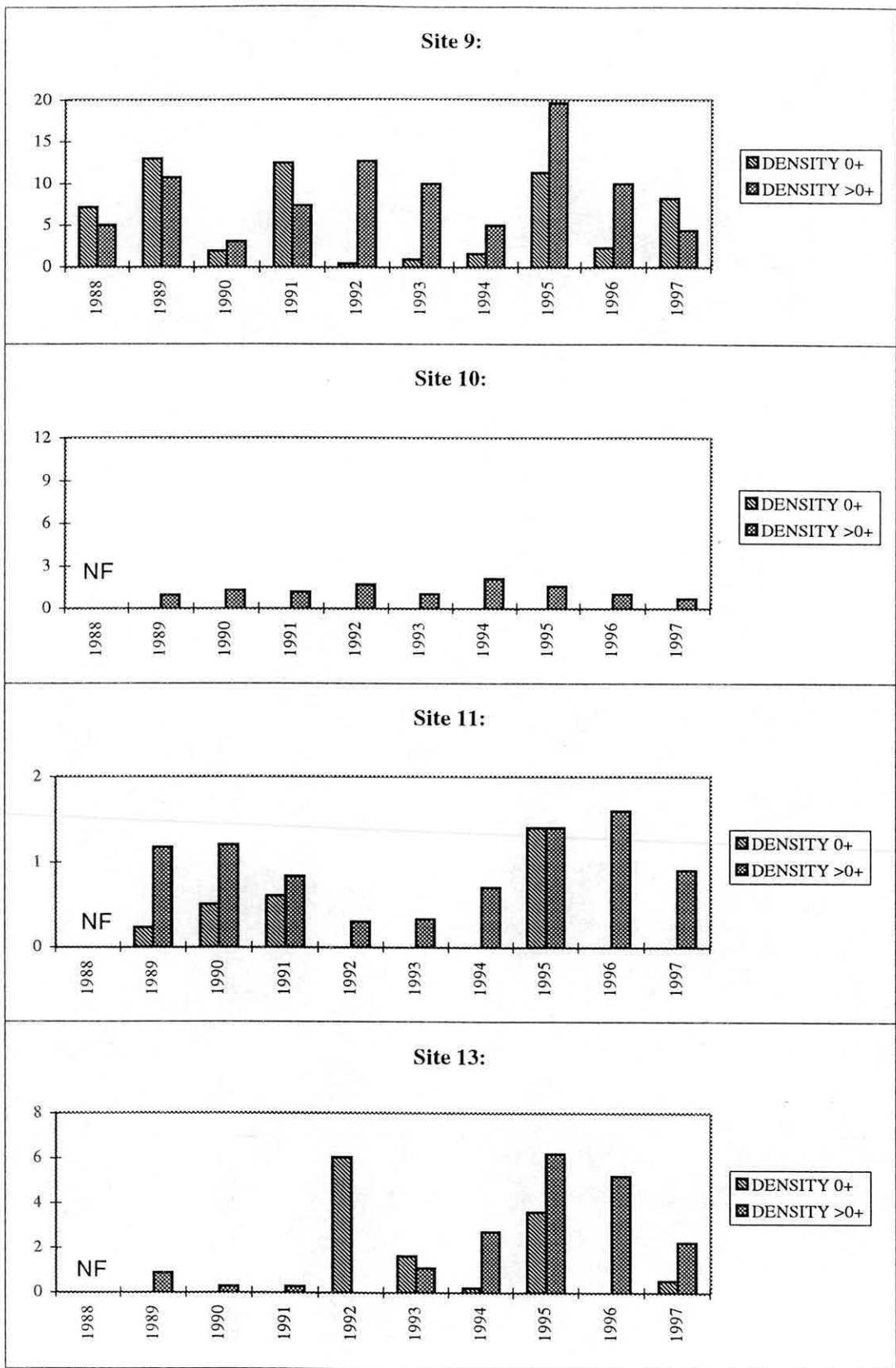


Figure 2:

Mean Site density of Trout / 100m<sup>2</sup>

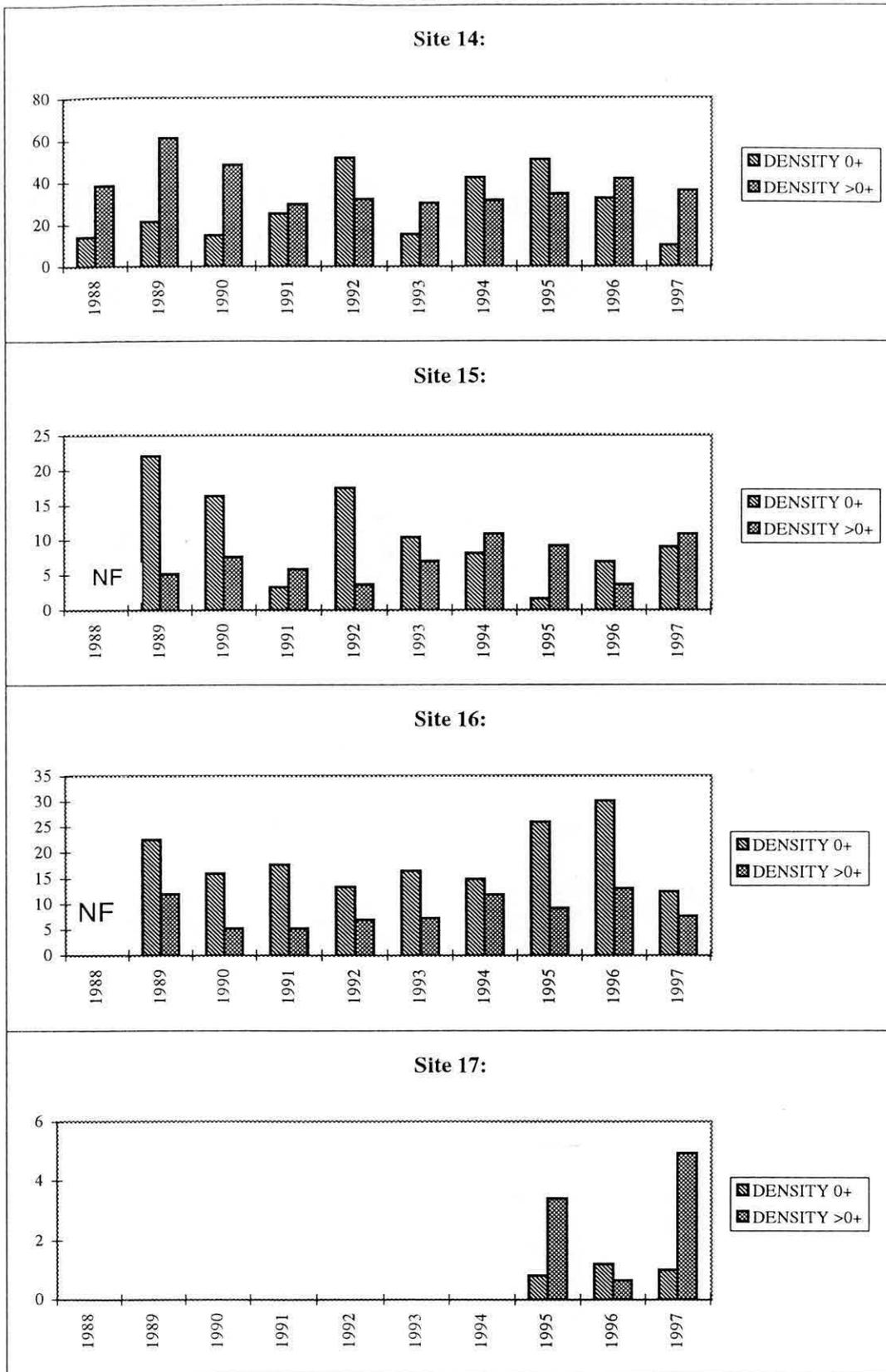


Figure 2:

Mean Site density of Trout / 100m<sup>2</sup>

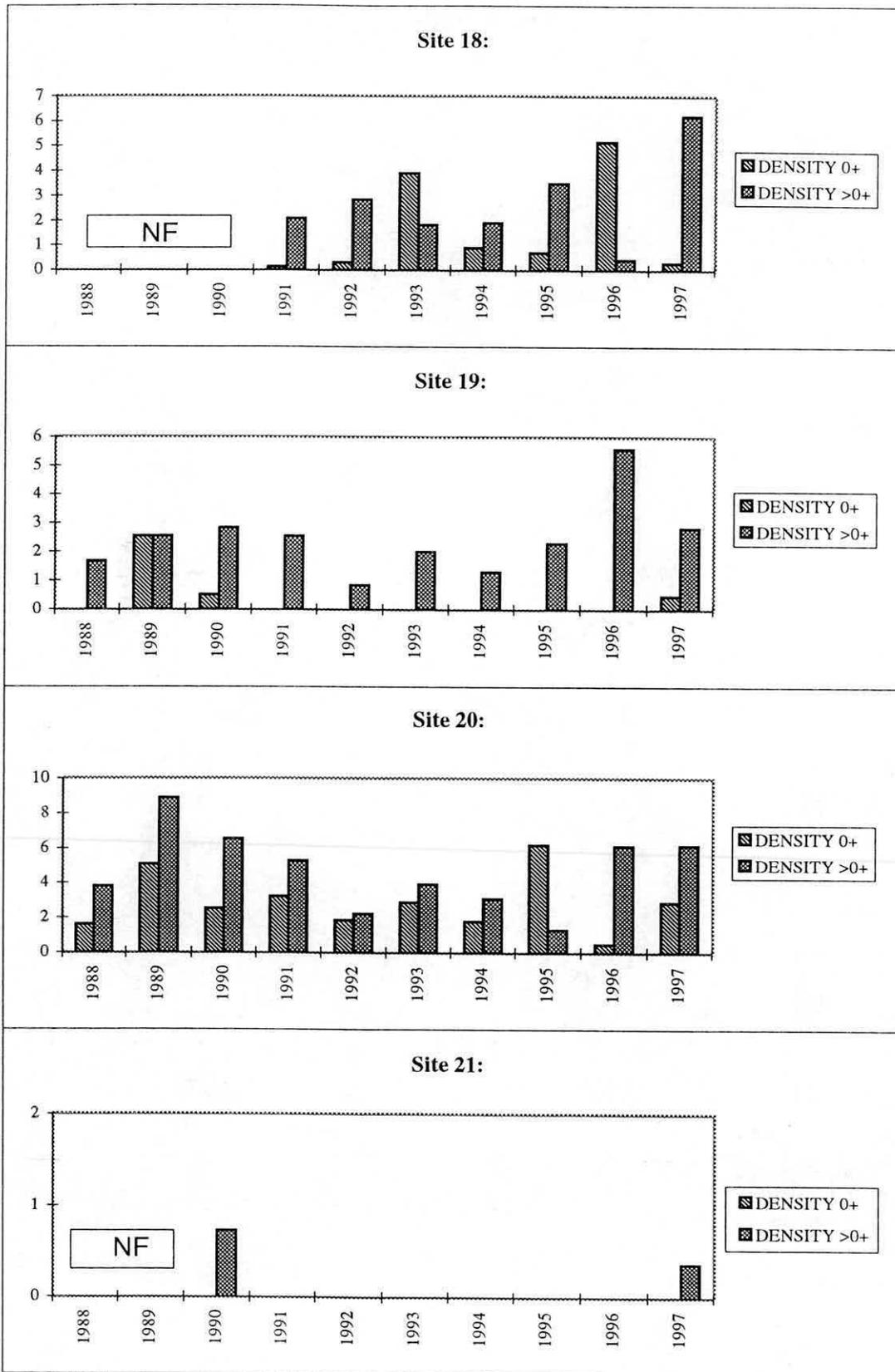


Figure 2:

Mean Site density of Trout / 100m<sup>2</sup>

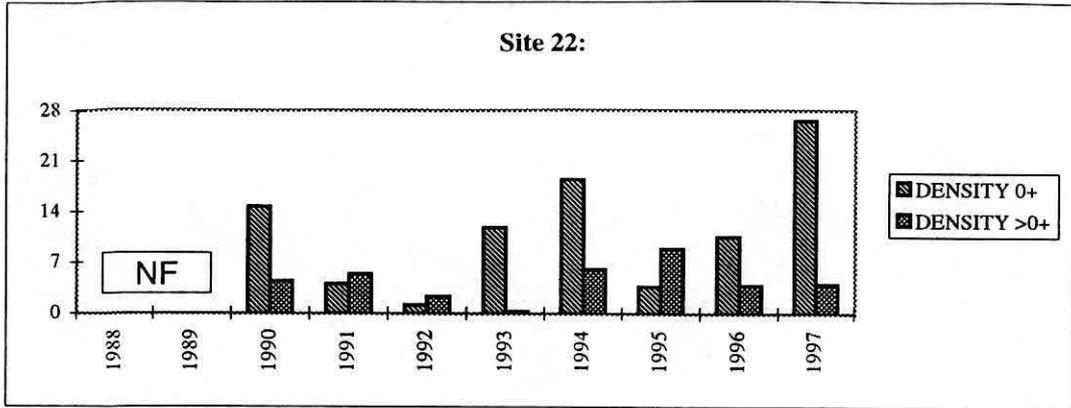


Figure 3.

