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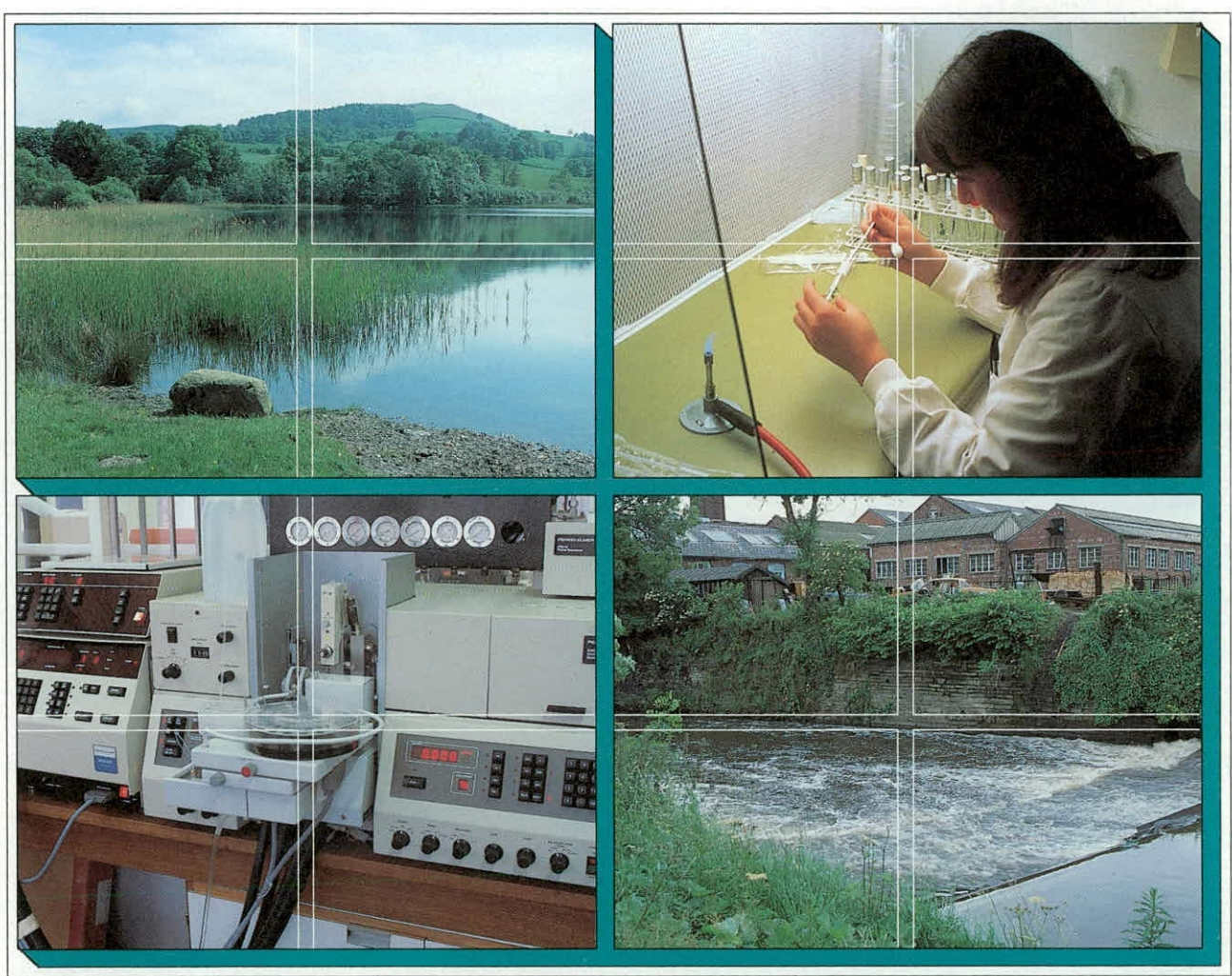
**Institute of  
Freshwater  
Ecology**

# Acid waters monitoring 1994 Report on fish studies

**W.R.C. Beaumont, LMIFM**

Report To:  
IFE Report Ref. No:

ENSIS Ltd  
RL/T11050j1/6





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# **Acid waters monitoring 1994 Report on fish studies**

**W.R.C. Beaumont, LMIFM**

**Project Leader:**  
**Report Date:**  
**Report To:**

**W.R.C. Beaumont**  
**March 1995**  
**ENSIS Ltd**  
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**IFE Report Ref. No:**

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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 7 of the study (1994). 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 is due for completion in 1995.

## Fish population data analysis: 1994

Fish population surveys of the UK Acid Waters Monitoring sites were carried out between 1/9/94 and 27/10/94. Conditions for fishing appeared to be good at most sites with the majority of sites having low or moderate flow conditions. Very low water levels caused problems at site 2 where the upstream survey reach had dried! A nearby section of "wet" river was fished in its place. Problems with weighing fish made its annual appearance; this year at site 16 (Mynach), where some data were lost. A slightly later than normal fishing at Mynach also resulted in some larger, probably non-resident, spawning fish being caught. Table 1 gives site details and dates of sampling.

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 126 population estimates, 39 had zero catch, 13 produced valid results of populations in excess of 30 fish, 54 had less than 30 fish present, and 1 produced invalid results as a result of uneven drop off in catches between fishings. In 18 cases, where it was not possible to calculate a population estimate from catch data, minimum population densities have been calculated from the actual catch numbers. A total of 4 out of the 22 sites had no fish present.

Salmon data were not stratified; out of the 6 reaches where they were present 2 produced valid results of over 30 fish present, 3 had less than 30 fish present and 1 produced an invalid result.

Where it was possible to calculate population data (67 estimates), capture efficiencies for trout ranged from 27% to 91%. Only 8 estimates had efficiencies below 50%; however 3 estimates had efficiencies below 40% and the standard error of these estimates is consequentially large. For salmon, only 1 estimate had a capture efficiency below 50%.

Table 2 gives the data from the fish surveys. 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:  $\text{Var}(T) = \sqrt{(\text{SE}(N_i))^2}$ ; 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.

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 0.007 to 0.70 fish per square metre.

Figure 2 shows the age stratified trout densities at each site since 1988 (NF indicates the site was not fished that year). Data trends have been assessed and are reported on in the 5 year report.

## **HABSCORE**

I have had no response to the HABSCORE analysis carried out and presented in the last fish report. In the present climate of cost cutting in the network this is perhaps one area where time (and thus cost) savings could be made. A reduction to perhaps HABSCORING every five years may be adequate to show any gross changes in the habitat of the site. It may be, however, that significant time/cost savings are not made by omitting the HABSCORE; the site will still need to be measured and recording the other variables needed for HABSCORE may not take a significant amount of time when compared with the whole sampling trip. If this is the case, should HABSCORING continue despite the findings of last year's report?

Would all contractors please consider the above and give me your views and cost comparisons between HABSCORE and non-HABSCORE monitoring of the sites. If you wish confidentiality of your costings would you inform ENSIS of the costs and me of your views.

## **Equipment**

Breakdown of weighing gear continues to be an annual problem; where possible, contractors should try to ensure that they have back-up equipment available. If anyone can recommend reliable equipment please will they contact me. I use cheap (c. £30) battery operated scales bought from Argos, carry at least two of them and work on the principal that they are expendable.

## **The Future**

Problems affecting the future funding of the UKAWMN mean that there is a possibility that DoE may fund the network in 3-month contracts for the next year. This will have implications for the fish surveys as they all occur in the second and third quarters of the year. Hopefully these problems will soon be resolved and as far as possible plans should go ahead in preparation for carrying out the surveys in 1995. More details will be sent to contractors by ENSIS as they become available. Hopefully sense will prevail and we can look forward to a further period of research on the various streams and burns in the network.

## 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.
- Patrick S., Waters D., Juggins S. & Jenkins A. (1991) The United Kingdom Acid Waters Monitoring Network: Site descriptions and methodology report. Report to DOE and DOE (NI) April 1991 ENSIS Ltd.

**TABLE 1.**

Contractor & Contact name	Site	Date Sampled	Flow
DAFS Peter Collen	1. Loch Coire nan Arr outflow	9-9-94	Med/High
	2. Allt a Mharcaidh outflow	2-9-94	Very Low. U/S sect. dry
	3. Allt na Coire nan con (Pollock Burn)	13-9-94	Moderate
	4. Lochnagar outflow	1-9-94	Low/Med
	5. Loch Chon outflow	5&7-9-94	Moderate
	6. Loch Tinker outflow	6-9-94	Moderate
	7. Round loch of Glenhead outflow	15-9-94	Moderate
	8. Loch Grannoch outflow	30-9-94	Medium
	9. Dargal Lane	7-10-94	Med/Low
IFE J Fletcher	10. Scoat Tarn outflow	28-9-94	Moderate
	11. Burnmoor Tarn outflow	29-9-94	Moderate
NRA NW-Region	12. River Etherow	Not Fished	
QMW A Hildrew	13. Old Lodge	27-10-94	
Plymouth Univ P Reay	14. Narrator Brook	28-9-94	Low
NRA Welsh Reg J Bräy	15. Llyn Llagi outflow	19-10-94	Low
	16. Llyn Cwm Mynach outflow	26-10-94	Ave/High
NRA Welsh Reg Paul Edwards	17. Afon Hafren	25-10-94	Med/High
	18. Afon Gwy	27-10-94	Mod/High
DANI Ian Moffett	19. Beaghs Burn	23-9-94	Moderate
	20. Bencrom River	29-9-94	Low
	21. Blue loch outflow	27-9-94	Moderate
	22. Conyglan Burn	26-9-94	Moderate



TABLE 2

Site No	TROUT	AGE	LOWER REACH							CODE
	Name		C	N	SE*2	P	D	SE*2	X2	
1	Coire nan arr	0+	2	2	0.00	0.67	0.006	0.00	0.93	LC
		>0+	20	24	8.32	0.44	0.068	0.02	0.15	LC
2	Allt a Mharcaidh	0+	105	127	22.26	0.44	0.819	0.14	0.31	V
		>0+	18	18	0.00	0.75	0.116	0.00	3.05	LC
3	Coire nan Con	0+	33	34	2.49	0.65	0.105	0.01	2.89	V
		>0+	0	-	-	-	0.000	-	-	
4	Lochnagar	0+	28	35	12.57	0.41	0.473	0.17	0.39	LC
		>0+	27	27	0.00	0.77	0.365	0.00	0.36	LC
5	Water of Chon	0+	64	65	2.31	0.70	0.188	0.01	0.26	V
		>0+	3	-	-	-	0.009	-	-	ME
6	Loch Tinker	0+	0	-	-	-	0.000	-	-	
		>0+	1	-	-	-	0.010	-	-	ME
7	Round loch of Glenhead	0+	2	0			0.025	-	-	ME
		>0+	4	4	0.00	0.80	0.051	0.00	0.34	LC
8	Loch Grannoch	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
9	Dargal Lane	0+	0	-	-	-	0.000	-	-	
		>0+	10	10	0.00	0.83	0.083	0.00	0.51	LC
10	Scoat Burn	0+	0	-	-	-	0.000	-	-	
		>0+	5	-	-	-	0.043	-	-	ME
11	Burnmoor Tarn	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
12	Etherow	0+		-	-	-	-	-	-	
		>0+		-	-	-	-	-	-	
13	Old Lodge	0+	0	-	-	-	0.000	-	-	
		>0+	6	6	0.00	0.60	0.046	0.00	0.63	LC
14	Narrator Brook	0+	5	5	0.00	0.63	0.071	0.00	0.75	LC
		>0+	27	29	4.22	0.56	0.414	0.06	0.26	LC
15	Llyn Llagi	0+	18	19	2.61	0.56	0.137	0.02	0.51	LC
		>0+	18	18	0.00	0.86	0.129	0.00	2.17	LC
16	Llyn Cwm Mynach	0+	18	18	0.00	0.78	0.116	0.00	0.17	LC
		>0+	15	17	4.87	0.48	0.110	0.03	0.32	LC
17	Afon Hafren	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
18	Afon Gwy	0+	5	5	0.00	0.83	0.017	0.00	0.26	LC
		>0+	2	-	-	-	0.007	-	-	ME
19	Beagh's Burn	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
20	River Bencrom	0+	4	4	0.00	0.67	0.023	0.00	2.60	LC
		>0+	2				0.011	-	-	ME
21	Blue Lough	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
22	Conyglan Burn	0+	25	25	0.00	0.76	0.106	0.00	0.49	LC
		>0+	11	11	0.00	0.79	0.047	0.00	1.16	LC

TABLE 2

Site No	TROUT	AGE	MIDDLE REACH							CODE
	Name		C	N	SE*2	P	D	SE*2	X2	
1	Coire nan arr	0+	24	24	0.00	0.75	0.051	0.00	0.57	LC
		>0+	26	28	4.37	0.56	0.059	0.01	0.45	LC
2	Allt a Mharcaidh	0+	97	101	5.48	0.64	0.616	0.03	0.40	V
		>0+	31	31	0.00	0.76	0.189	0.00	1.11	V
3	Coire nan Con	0+	14	14	0.00	0.74	0.060	0.00	2.81	LC
		>0+	1	-	-	-	0.004	-	-	ME
4	Lochnagar	0+	37	38	2.42	0.65	0.585	0.04	0.75	V
		>0+	16	17	2.79	0.55	0.262	0.04	2.58	LC
5	Water of Chon	0+	127	138	11.08	0.56	0.375	0.03	0.15	V
		>0+	2	2	0.00	0.67	0.005	0.00	0.93	LC
6	Loch Tinker	0+	0	-	-	-	0.000	-	-	
		>0+	1	1	0.00	0.50	0.010	0.00	2.87	LC
7	Round loch of Glenhead	0+	3	3	0	0.50	0.031	0	1	LC
		>0+	3	-	-	-	0.030	-	-	ME
8	Loch Grannoch	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
9	Dargal Lane	0+	3	-	-	-	0.029	-	-	ME
		>0+	5	5	0.00	0.63	0.049	0.00	0.75	LC
10	Scoat Burn	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
11	Burnmoor Tarn	0+	0	-	-	-	0.000	-	-	
		>0+	2	-	-	-	0.010	-	-	ME
12	Etherow	0+	-	-	-	-	-	-	-	
		>0+	-	-	-	-	-	-	-	
13	Old Lodge	0+	0	-	-	-	0.000	-	-	
		>0+	4	-	-	-	0.035	-	-	ME
14	Narrator Brook	0+	15	15	0.00	0.65	0.124	0.00	0.73	LC
		>0+	36	38	4.01	0.60	0.314	0.03	0.64	V
15	Llyn Llagi	0+	7	7	0.00	0.64	0.043	0.00	0.42	LC
		>0+	17	17	0.00	0.81	0.105	0.00	1.27	LC
16	Llyn Cwm Mynach	0+	14	14	0.00	0.74	0.115	0.00	0.15	LC
		>0+	19	19	0.00	0.83	0.156	0.00	0.78	LC
17	Afon Hafren	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
18	Afon Gwy	0+	1	-	-	-	0.004			ME
		>0+	5	5	0.00	0.62	0.021	0.00	0.75	LC
19	Beagh's Burn	0+	0	-	-	-	0.000	-	-	
		>0+	1	1	0.00	0.50	0.008	0.00	2.87	LC
20	River Bencrom	0+	3	3	0.00	0.75	0.014	0.00	0.51	LC
		>0+	6	6	0.00	0.67	0.028	0.00	0.78	LC
21	Blue Lough	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
22	Conyglan Burn	0+	42	44	3.98	0.63	0.185	0.02	0.99	V
		>0+	14	14	0.00	0.82	0.059	0.00	0.84	LC

TABLE 2

TROUT		UPPER REACH								
Site No	Name	AGE	C	N	SE*2	P	D	SE*2	X2	CODE
1	Coire nan arr	0+	7	7	0.00	0.78	0.016	0.00	0.82	LC
		>0+	31	35	7.24	0.50	0.082	0.02	3.31	V
2	Allt a Mharcaidh	0+	9	9	0.00	0.75	0.049	0.00	1.53	LC
		>0+	29	30	2.51	0.63	0.163	0.01	0.92	LC
3	Coire nan Con	0+	23	25	4.465	0.55	0.100	0.18	0.15	LC
		>0+	8	8	0.00	0.67	0.032	0.00	0.33	LC
4	Lochnagar	0+	19	25	12.17	0.37	0.347	0.17	0.42	LC
		>0+	5	5	0.00	0.56	0.069	0.00	1.06	LC
5	Water of Chon	0+	67	76	11.40	0.50	0.207	0.03	6.21	V
		>0+	5	5	0.00	0.63	0.014	0.00	0.08	LC
6	Loch Tinker	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
7	Round loch of Glenhead	0+	0	-	-	-	0.000	-	-	
		>0+	2	-	-	-	0.035	-	-	ME
8	Loch Grannoch	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
9	Dargal Lane	0+	4	4	0.00	0.80	0.018	0.00	0.34	LC
		>0+	4	-	-	-	0.018	0.00	0.34	LC
10	Scoat Burn	0+	0	-	-	-	0.000	-	-	
		>0+	2	-	-	-	0.019	-	-	ME
11	Burnmoor Tarn	0+	0	-	-	-	0.000	-	-	
		>0+	2	2	0.00	0.50	0.010	0.00	5.75	IVLC
12	Etherow	0+	-	-	-	-	-	-	-	
		>0+	-	-	-	-	-	-	-	
13	Old Lodge	0+	1	-	-	-	0.007	-	-	ME
		>0+	0	-	-	-	0.000	-	-	
14	Narrator Brook	0+	72	119	64.50	0.27	1.062	0.58	0.90	V
		>0+	19	23	8.14	0.42	0.205	0.07	0.26	LC
15	Llyn Llgi	0+	9	9	0.00	0.64	0.064	0.00	0.62	LC
		>0+	13	13	0.00	0.81	0.092	0.00	1.57	LC
16	Llyn Cwm Mynach	0+	16	25	20.53	0.28	0.212	0.17	2.42	LC
		>0+	10	10	0.00	0.91	0.085	0.00	0.11	LC
17	Afon Hafren	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
18	Afon Gwy	0+	1	-	-	-	0.006	-	-	ME
		>0+	5	5	0.00	0.71	0.028	0.00	1.32	LC
19	Beagh's Burn	0+	0	-	-	-	0.000	-	-	
		>0+	4	4	0.00	0.57	0.031	0.00	-	LC
20	River Bencrom	0+	3	-	-	-	0.017	-	-	ME
		>0+	9	-	-	-	0.053	0.00	0.13	LC
21	Blue Lough	0+	0	-	-	-	0.000	-	-	
		>0+	0	-	-	-	0.000	-	-	
22	Conyglan Burn	0+	51	54	4.96	0.59	0.262	0.02	0.82	V
		>0+	16	16	0.00	0.76	0.078	0.00	2.32	LC

TABLE 2

Site No	TROUT		SITE TOTAL				
	Name	AGE	TC	TN	SE*2	XD	SE*2
1	Coire nan arr	0+	33	33	0.00	0.024	0.00
		>0+	77	87	3.95	0.070	0.01
2	Allt a Mharcaidh	0+	211	237	7.64	0.495	0.05
		>0+	78	79	0.84	0.156	0.00
3	Coire nan Con	0+	70	73	1.70	0.088	0.06
		>0+	9	-	-	0.012	-
4	Lochnagar	0+	84	98	5.89	0.468	0.08
		>0+	48	49	0.93	0.232	0.01
5	Water of Chon	0+	258	279	5.35	0.257	0.01
		>0+	10	-	-	0.009	-
6	Loch Tinker	0+	0	-	-	0.000	-
		>0+	2	-	-	0.007	-
7	Round loch of Glenhead	0+	5	-	-	0.019	-
		>0+	9	-	-	0.039	-
8	Loch Grannoch	0+	0	-	-	0.000	-
		>0+	0	-	-	0.000	-
9	Dargal Lane	0+	7	-	-	0.016	-
		>0+	19	-	-	0.050	0.00
10	Scoat Burn	0+	0	-	-	0.000	-
		>0+	7	-	-	0.021	-
11	Burnmoor Tarn	0+	0	-	-	0.000	-
		>0+	4	-	-	0.007	-
12	Etherow	0+	-	-	-	-	-
		>0+	-	-	-	-	-
13	Old Lodge	0+	1	-	-	0.002	-
		>0+	10	-	-	0.027	-
14	Narrator Brook	0+	92	139	21.50	0.419	0.19
		>0+	82	90	3.34	0.311	0.03
15	Llyn Llagi	0+	34	35	0.87	0.081	0.01
		>0+	48	48	0.00	0.109	0.00
16	Llyn Cwm Mynach	0+	48	57	6.84	0.148	0.06
		>0+	44	46	1.62	0.117	0.01
17	Afon Hafren	0+	0	-	-	0.000	-
		>0+	0	-	-	0.000	-
18	Afon Gwy	0+	7	-	-	0.009	-
		>0+	12	-	-	0.019	-
19	Beagh's Burn	0+	0	-	-	0.000	-
		>0+	5	-	-	0.013	-
20	River Bencrom	0+	10	-	-	0.018	-
		>0+	17	-	-	0.031	-
21	Blue Lough	0+	0	-	-	0.000	-
		>0+	0	-	-	0.000	-
22	Conyglan Burn	0+	118	123	2.12	0.184	0.01
		>0+	41	41	0.00	0.061	0.00







TABLE 3

	SALMON	SITE TOTAL				
Site No	Name	TC	TN	SEx2	XD	SEx2
2	Allt a Mharcaidh	26	26.00	0.00	0.05	0.00
3	Coire nan Con	371	418.00	8.88	0.51	0.03



Figure 1.

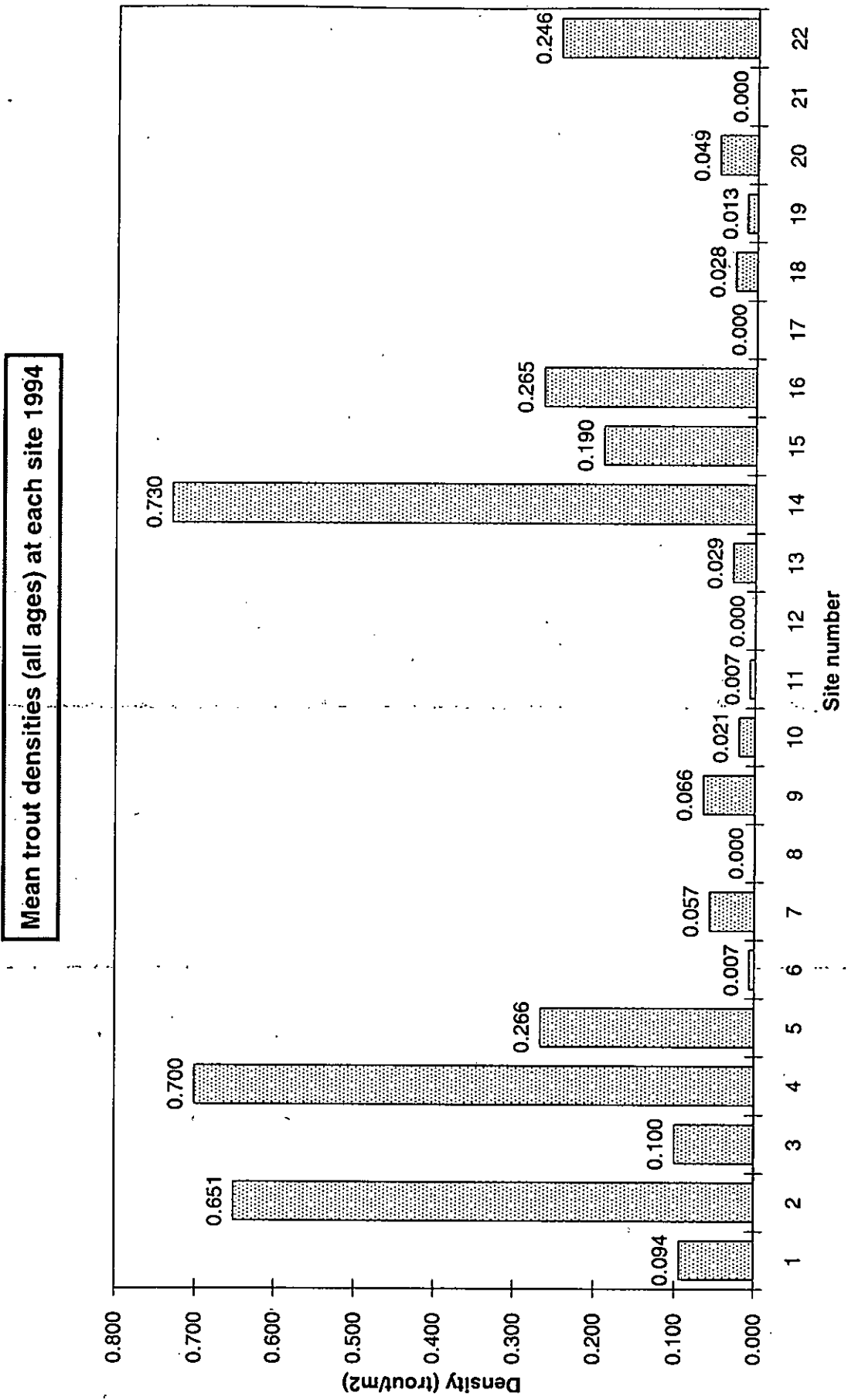


Figure 2:

Mean Site Densities of Trout /100m2

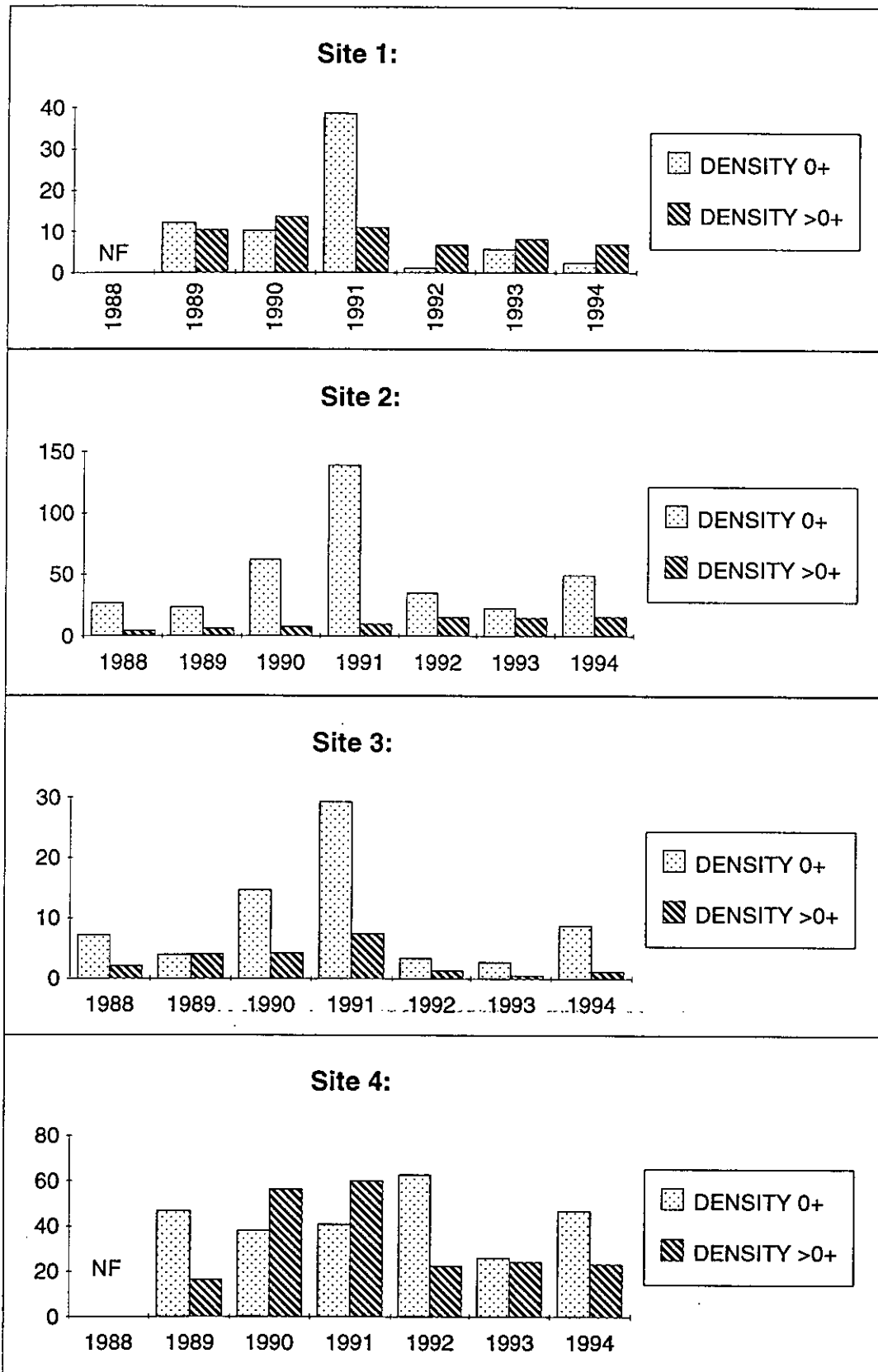


Figure 2:

Mean Site Densities of Trout/100m2

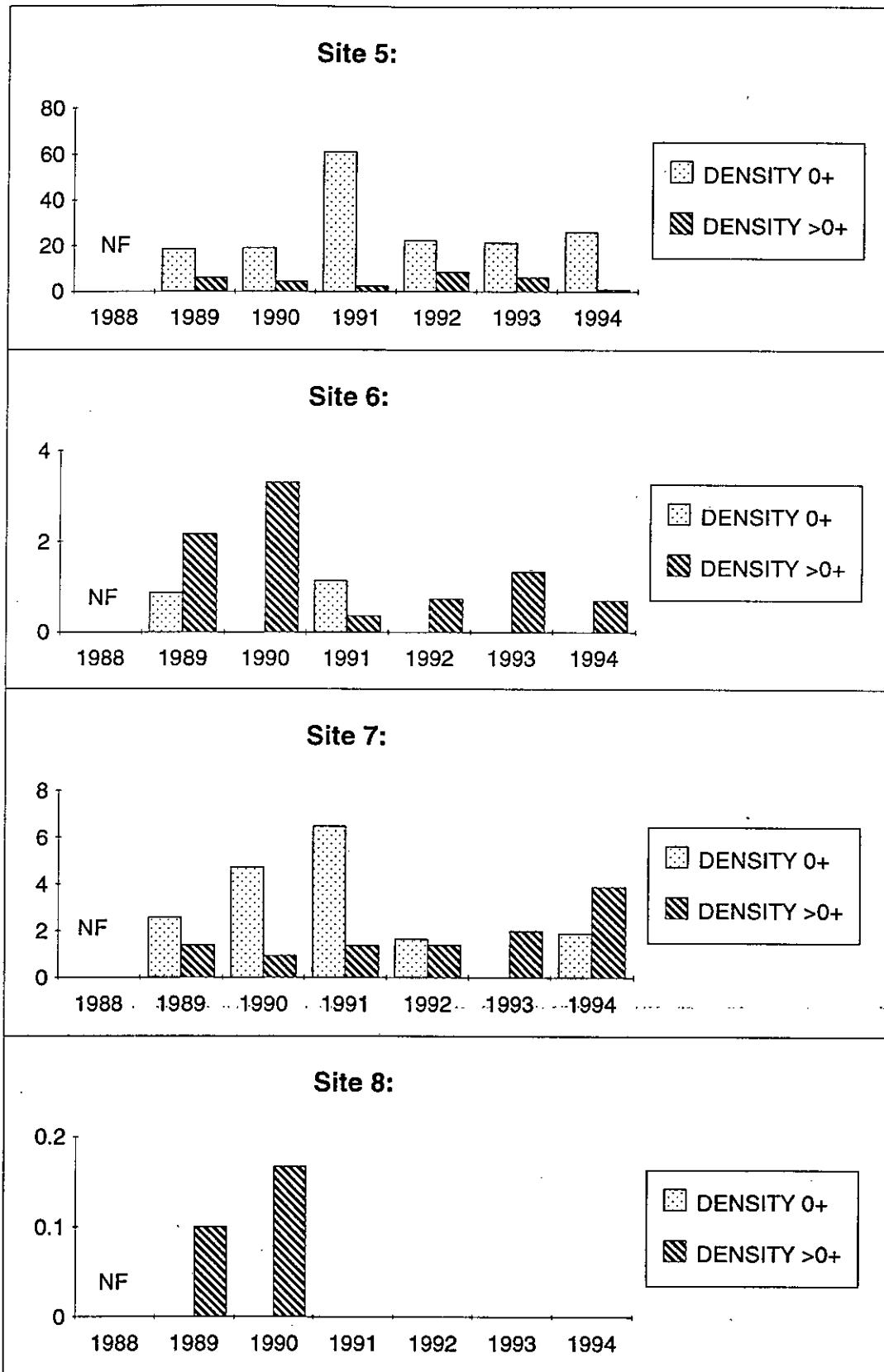


Figure 2:

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

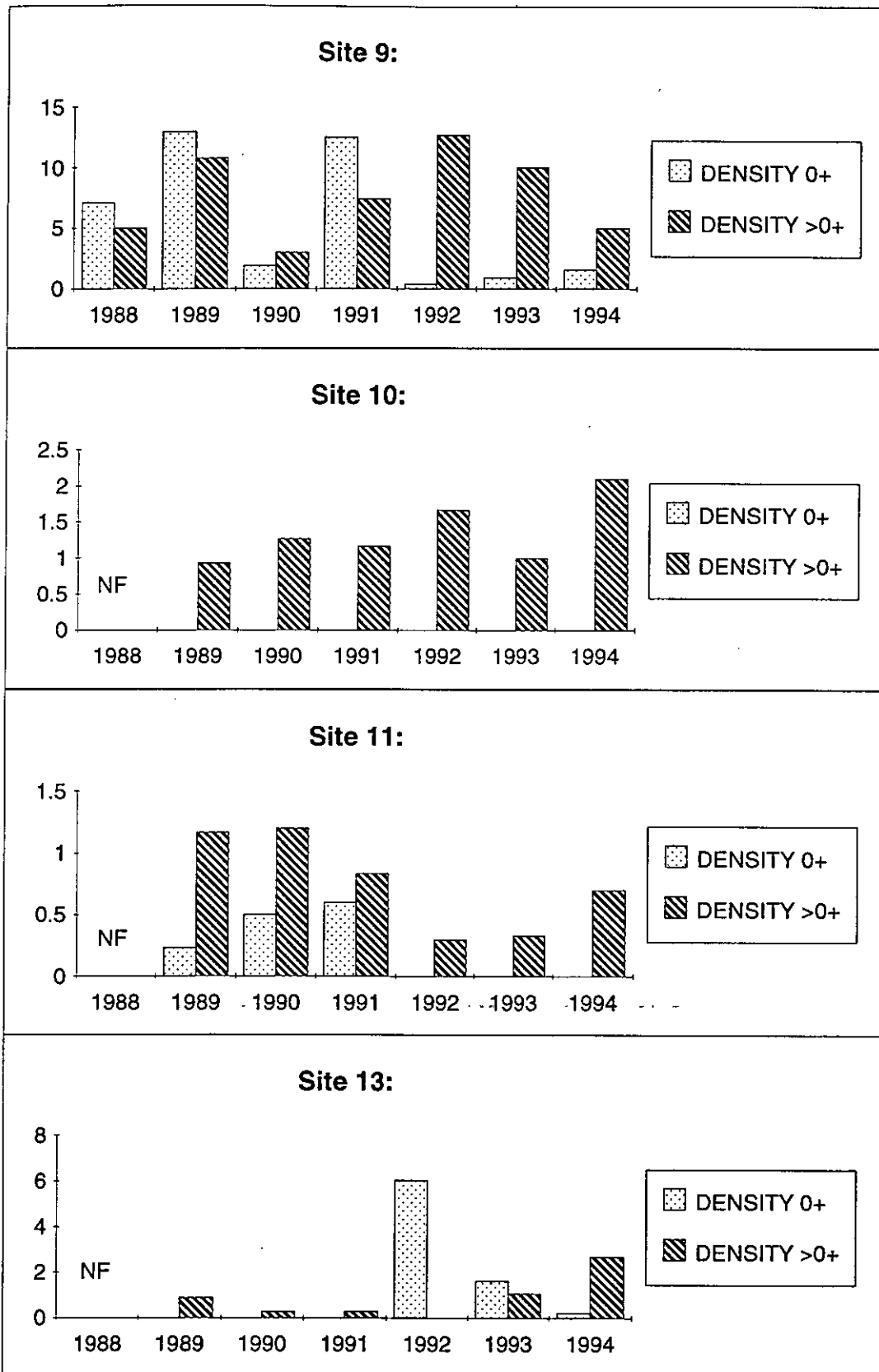


Figure 2:

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

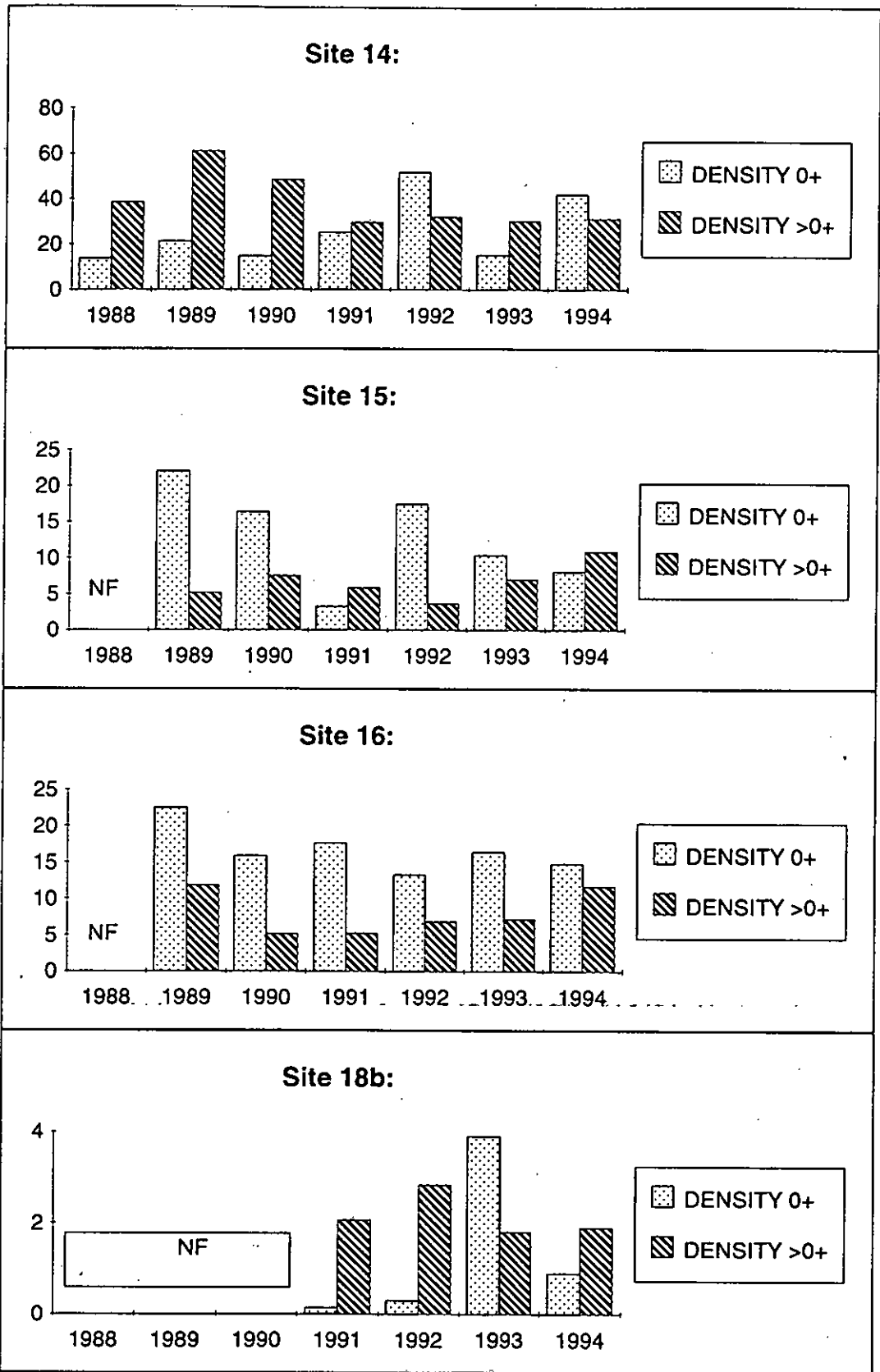


Figure 2:

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

