

## FISHERY SURVEY OF THE HORNER WATER CATCHMENT

## 1. INTRODUCTION

- 1.1 This fishery survey of the Horner Water catchment was started in September 1992 but wet weather prevented its conclusion. The survey was resumed and completed in September 1993. The watercourses surveyed were the Horner Water itself and its tributaries East Water and the River Aller.
- 1.2 The majority of the catchment is owned by the National Trust.

## 2. TOPOGRAPHY AND GEOLOGY

- 2.1 The Horner Water and East Water rise on the slopes of Dunkery Beacon, which at 519 metres AOD is the highest point of Exmoor. The river falls steeply all the way to the sea at Porlock Bay. Most of the year the water percolates through the shingle ridge but at times of very high flow the volume of water is sufficient to blast a clear channel.
- 2.2 The River Aller is fed from several streams which arise on the lower slopes of Dunkery and hills to the east. Gradients are gentle when compared with those of the Horner Water.
- 2.3 Devonian Hangman grits outcrop extensively at the top of the catchment. Triassic mudstones and sandstones overlie the Devonian in places especially in the lower reaches and all the valleys have extensive alluvial gravel deposits.
- 2.4 The relationship between the various watercourses is shown on the map (Appendix 1).

APPENDIX 1

## 3. WATER QUALITY

- 3.1 Chemical water quality is shown in Figure WQ1 for most of the Horner Water and the River Aller. All these waters have high chemical quality, Class 1a. FIGURE WQ1
- 3.2 Biological water quality is shown in Figure WQ2 and all waters are good, class A. The method of biological assessment checks the observed invertebrate score against that predicted from an analysis of the physical nature of the river at each site. FIGURE WQ2
- 3.3 The EEC Fishery Designation is shown in Figure WQ3. Designation has only been applied to the lower reaches which are all salmonid. FIGURE WQ3
- 3.4 There are no significant consented discharges within the catchment and there have been no serious water quality problems within the catchment in the last two years.

## 4. FLOW

- 4.1 There is one gauging station in this catchment, at West Luccombe on the Horner Water. Analysis of flow statistics

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and a comparison with the River Tone are shown in Table 1 and further details are included as Appendix 2.

## APPENDIX 2

Table 1 FLOW STATISTICS FOR THE HORNER WATER AT WEST LUCCOMBE COMPARED WITH THE R.TONE AT BISHOPS HULL

	HORNER	TONE
Period of years covered by record	18	30
Catchment area above gauging station (sq.km)	21	202
Height of highest point of catchment (metres AOD)	519	409
Average daily flow in cumecs (a.d.f.)	0.44	3.03
95 per cent exceeded flow (m <sup>3</sup> /s)	0.06	0.61
FLOW RANGE percentage of days per year:		
over 4 x a.d.f.	2	2.5
between 2 x a.d.f. and 4 x a.d.f.	11	9
between a.d.f. and 2 x a.d.f.	20	18.5
between 0.75 a.d.f. and a.d.f.	9	10
between 0.5 a.d.f. and 0.75 a.d.f.	13	17
between 0.25 a.d.f. and 0.5 a.d.f.	22	31
between 0.125 a.d.f. and 0.25 a.d.f.	18.5	11
below 0.125 a.d.f.	4.5	1

4.2 Table 1 indicates that the Horner Water like the Tone has a high percentage of days when flows are quite low and a significant period when flows are very high. During the periods of very low flow the lower part of the Horner Water near Bossington dries up as all flow becomes alluvial.

#### 5. ABSTRACTION

5.1 There are only four abstraction licences from surface waters within the Horner Water catchment, one for water supply from Nutscale reservoir and three for amenity on the River Aller.

#### 6. IMPOUNDMENTS

6.1 The only notable impoundment on the Horner Water system is the dam which retains Nutscale Reservoir. This 3.24 hectare (8 acres) reservoir provides drinking water for part of West Somerset. Although it is owned by Wessex Water, the fishing rights are owned by the National Trust and leased.

6.2 There are numerous waterfalls on the Horner Water and a few weirs. As the river gradient is steep weirs are not very high and none of the falls are thought to be impassable at times of high flow.

6.3 Two features prevent fish movement: the dam of Nutscale reservoir and the shingle ridge at the coastal limit. The



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ridge normally prevents the entry of migratory trout but there may be times when a breach caused by high flows coincides with the presence of migratory trout in the Bay.

- 6.4 On the River Aller there are a few weirs associated with mills and old water meadows. One water meadow structure which has been reinstated recently could restrict trout movement but it is not in place throughout the year.

## 7. FISHERY SURVEY METHOD

- 7.1 Sample sites were chosen by dividing the various watercourses into two kilometre lengths within which a 50 to 100 metre survey length was selected using random numbers. Table 2 lists the sample sites with their grid references; the location of all sample sites is shown on the maps which make up Appendix 1.

APPENDIX 1

Table 2 SURVEY SITES

HORNER WATER			
H01A	Nutscale Water	SS857424	28/9/92
H01B	Tarr Ball Wood	SS869448	16/9/93
H01C	below Lang Combe	SS884441	23/9/93
H01D	above East Water	SS897441	20/9/93
H01E	Burrowhayes Farm	SS899461	8/9/93
H01F	Bossington	SS897482	--
EAST WATER			
H01X	Cloutsham	SS896431	7/10/92
RIVER ALLER			
AR1A	Holt	SS926447	22/10/92
AR1B	Stratford	SS918457	19/10/92
AR1C	Holnicote House	SS906464	14/10/92

- 7.2 Sites on the Horner Water, East Water and the top site on the River Aller were electric fished using back-pack electric fishing equipment operating with smooth DC. All sites were waded and fished upstream.
- 7.3 The lower two sites on the River Aller were electric fished using conventional electric fishing gear operating with pulsed DC at 600 cycles per second. Both sites were waded and fished upstream.
- 7.4 All sites were isolated using stop nets which were weighted with chains. Population estimates were obtained by three repeated fishings (runs) using a declining catch method.
- 7.5 Site H01F at Bossington on the Horner Water was not fished. This part of the river had dried up prior to the survey and fish from the area had been rescued and moved upstream.

7.6 The Habscore system, which is being developed to predict trout populations from measures of the physical habitat, was used at all sites except AR1A. All these sites were believed to be unpolluted and the results were submitted as part of an NRA research and development programme to widen the application of the Habscore technique.

7.7 Site AR1A was not used for Habscore because one bank and some of the bed contained considerable amounts of inert rubbish.

## 8. RESULTS

8.1 All fish caught were measured and a large proportion were also weighed and had scales removed for age determination.

8.2 Figures 1 and 2 show the biomass and density of all fish over 10 centimetres in length caught at each site on the Horner Water. FIGURES 1 & 2

8.3 Figures 3 and 4 show the biomass and density of all fish over 10 centimetres caught at each site on the River Aller. FIGURES 3 & 4

8.4 All the figures are drawn to the same scale to facilitate direct comparison. Each bar is subdivided to indicate the species composition. Each species is indicated by a consistent colour and shading style.

8.5 Figure 5 compares the growth rate of brown trout on the upper Horner (sites H01A and H01X fished in 1992), the lower Horner (sites H01B to H01E fished in 1993) and the River Aller (fished in 1993). FIGURE 5

8.6 In Figure 5 a curve has been fitted to the points using a power regression of the form  $y=ax^b$ . R-squared was better than 0.989 for each of the three lines. FIGURE 5

## 9. DISCUSSION

9.1 The population and biomass of the Horner Water catchment are higher than those often seen in much of Somerset but are typical of the clean upland waters of the west of the county and similar waters elsewhere.

9.2 The Habscore system is still being revised so the results of this survey including the predictive measurements cannot be used to provide an objective assessment.

9.3 With good water quality it seems likely that the only limiting factor is the availability of suitable cover and spawning gravel. This is partly corroborated by the results from site H01C which produced a high density of fish from an extensive area of deep water.

9.4 The very fast flow of the Horner Water results in large quantities of boulder and cobble. As the trout do not

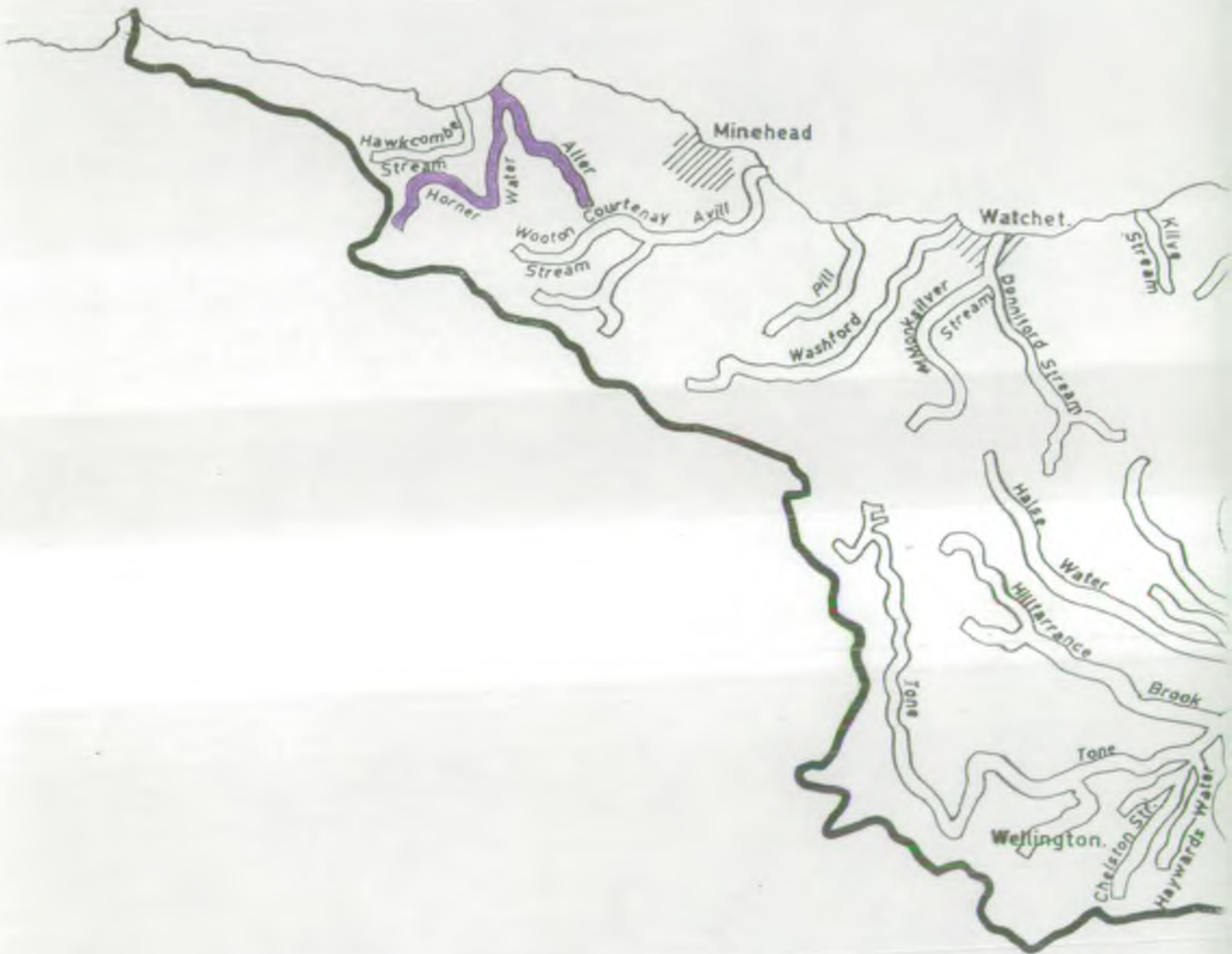
achieve great size, very few exceed 20cm in length, there may be a shortage of gravel of a size which can be cut for redds at some sites.

- 9.5 The growth curves shown in Figure 5 reveal that fish in the upper Horner Water sites which were in or close to the moorland headwaters had an apparent slower growth rate. This difference should be treated with caution as these two sites were surveyed in 1992 whereas the remainder of the main Horner Water was surveyed in 1993. **FIGURE 5**
- 9.6 The growth curves (Figure 5) also suggest that fish grow faster in the River Aller than in the Horner Water. This result is not surprising given the much gentler regime of the Aller. **FIGURE 5**
- 9.7 Although trout were found in the Aller at similar densities to the Horner Water the fish had a better condition factor (weight to length ratio) so that trout biomass in the Aller is much higher than that of the main Horner Water.
- 9.8 Although there appeared to be plenty of cover for trout at the upper River Aller sites, much of this was herbaceous. The upper sites lacked the extensive alder fringe which characterised the lowest site.
- 9.9 Eels were captured throughout the system with the exception of the site H01A above Nutscale Reservoir. This suggests that the high dam wall is an impassable barrier to eels under most circumstances. (A recent survey of the River Yeo system suggests a similar problem exists above Sutton Bingham Reservoir near Yeovil).
- 9.10 The fact that eels of all sizes were caught in the Horner system suggests that elvers are able to enter the river quite freely through the interstices of the shingle ridge at Porlock Bay.

## 10. CONCLUSIONS

- 10.1 If the use of Habscore is recommended following current research, the technique should be used to reveal if trout populations are close to their potential.
- 10.2 If the drying of the lowest reaches of the river cannot be prevented some remedial work should be considered to restrict alluvial flow and keep the channel in water. The only alternative to this is the near annual fish rescue.
- 10.3 The upper River Aller site could be improved by the removal of some of the inert rubbish present. Some alder planting could be encouraged here and further downstream.

Bristol Channel.



Chemical Quality

Good

1a

1b

Fair

2



Bristol Channel.



Biological Quality

Good A



Moderate B





Bristol Channel.



### EEC Fishery Designation

Salmonid

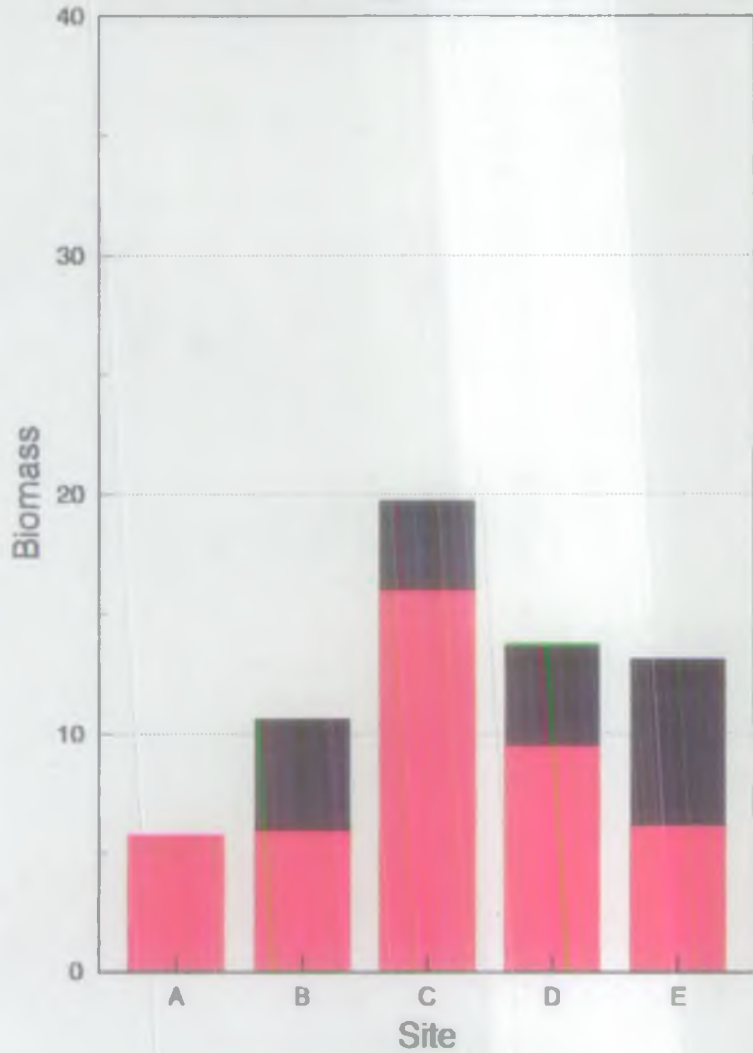


Cyprinid



# Horner Water 1992/93

Biomass of fish (gms per square metre)



■ B trout ■ Eel ■ Bullhead

# East Water 1992

Biomass of fish (gms per square metre)

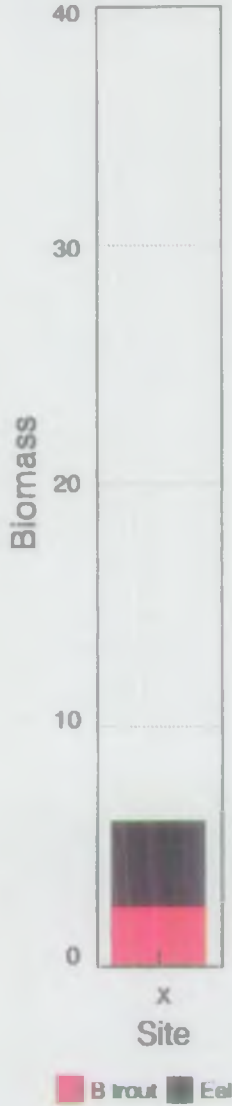
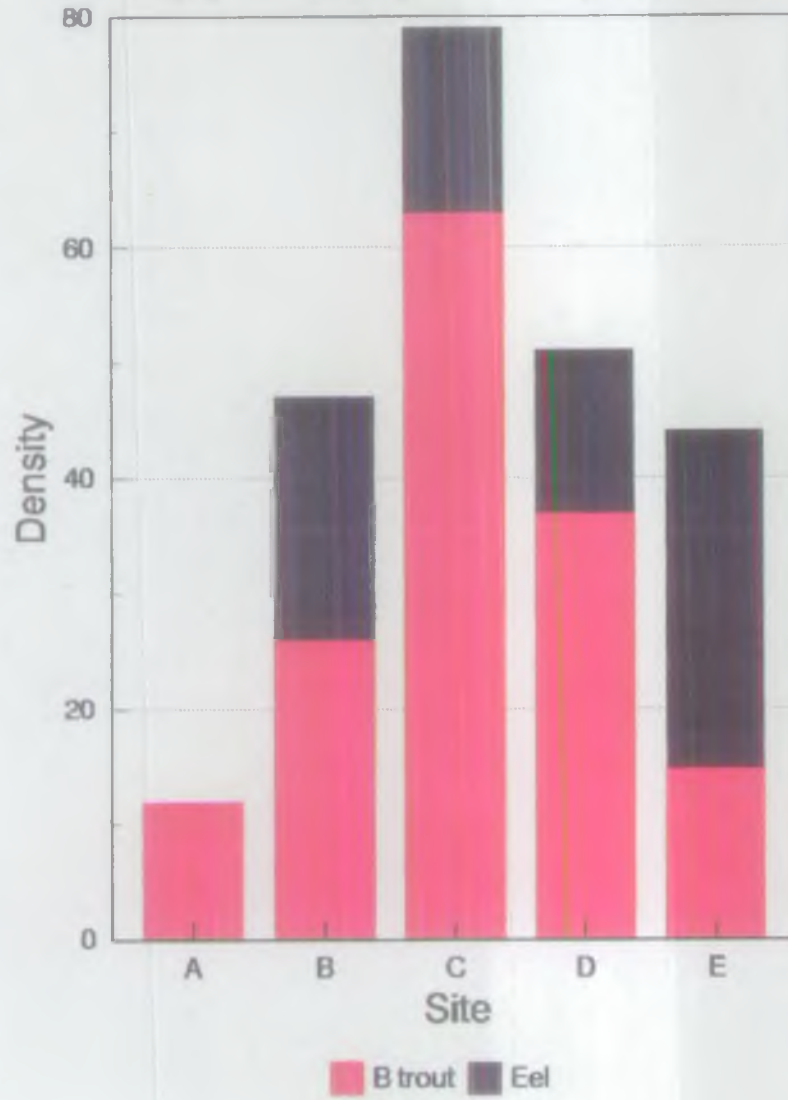


Figure 1

## Horner Water 1992/93

Density (Numbers per 100 square metres)



## East Water 1992

Density (Numbers per 100 square metres)

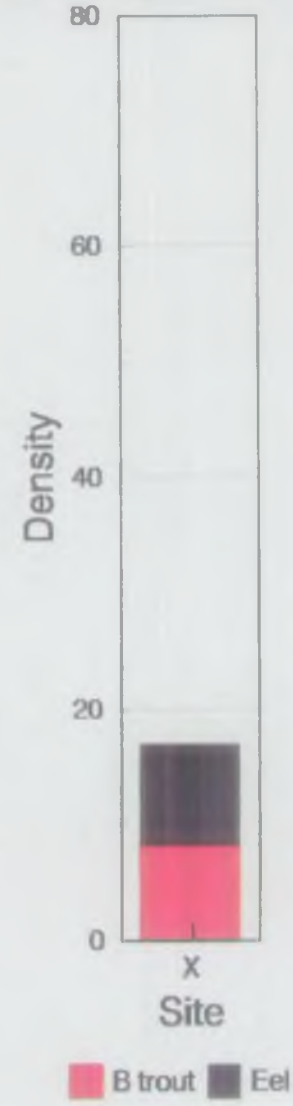


Figure 2

# River Aller 1992

Biomass of fish (gms per square metre)

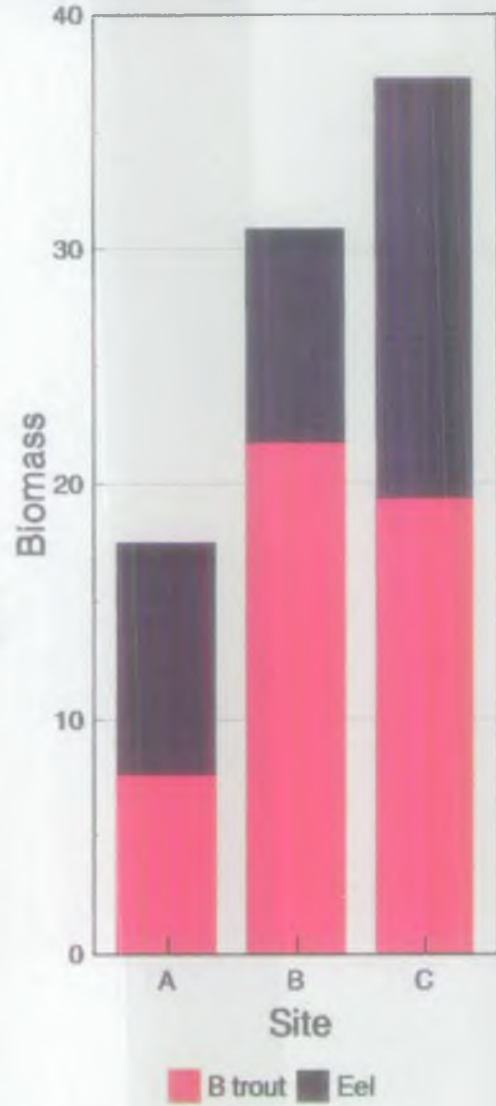


Figure 3

# River Aller 1992

Density (Numbers per 100 square metres)

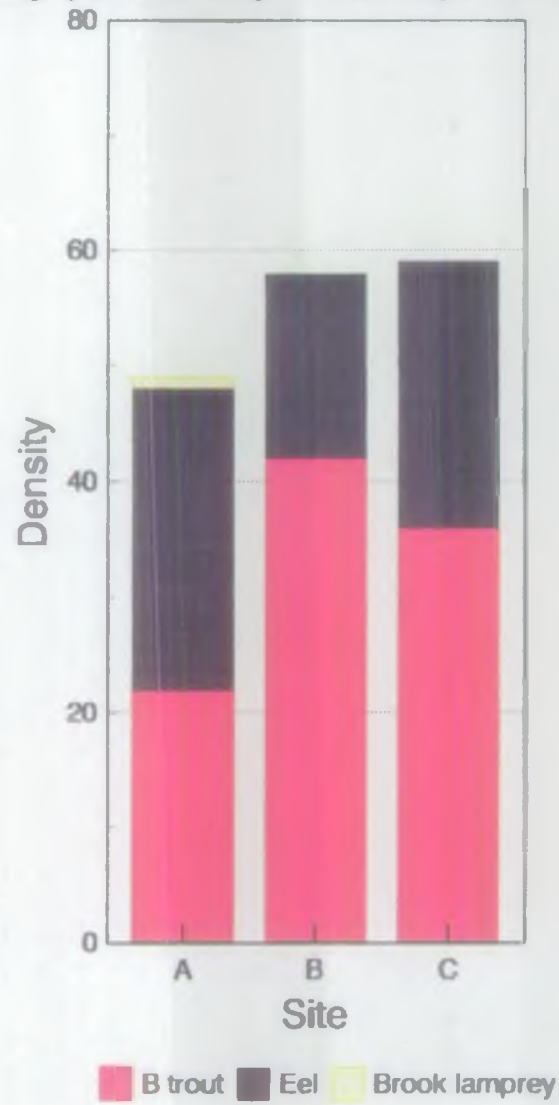


Figure 4

# Horner Water Catchment

## Growth Rate of Brown trout



Figure 5





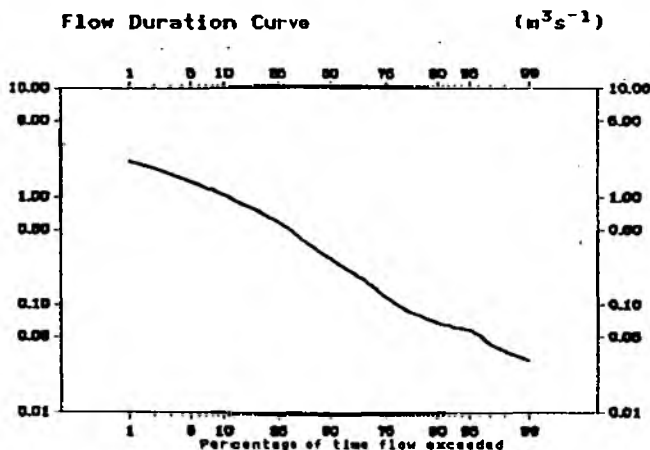
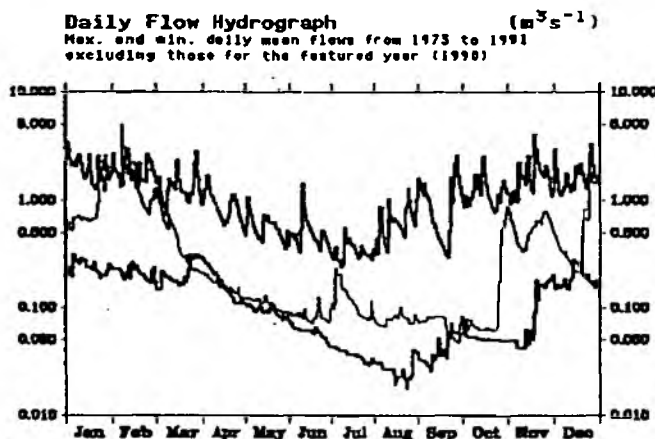


**Gauging Station Summary**  
**HORNER WATER AT WEST LUCCOMBE**

Station Number Gauged Flows  
 051002 1973-1991

Measuring Authority: NRA - Wessex

Grid Reference: 21 (SS) 898 458



**Flow Statistics**

Units:  $m^3s^{-1}$  unless otherwise stated

Mean flow	0.44
Mean flow ( $l s^{-1}/km^2$ )	21.16
Mean flow ( $10^6 m^3/yr$ )	13.9
Peak flow & date	10.0 18 Nov 1986
Highest daily mean & date	5.0 7 Feb 1990
Lowest daily mean & date	0.018 23 Aug 1976
10 day minimum & end date	0.022 24 Aug 1976
60 day minimum & end date	0.032 28 Aug 1976
10% exceedance	1.056
50% exceedance	0.276
95% exceedance	0.058
Mean annual flood	
Bankfull flow	

**Rainfall and Runoff**

	Rainfall (mm) (1986-1989)			Runoff (mm) (1973-1991)		
	Mean	Max/Yr	Min/Yr	Mean	Max/Yr	Min/Yr
Jan	149	200 1988	58 1987	189	174 1991	35 1976
Feb	110	202 1989	5 1986	99	198 1990	34 1986
Mar	150	171 1989	129 1986	77	148 1979	44 1984
Apr	90	121 1986	46 1988	47	88 1987	28 1990
May	78	125 1986	17 1989	29	60 1986	12 1974
Jun	74	96 1986	50 1989	22	49 1977	7 1976
Jul	67	145 1988	50 1984	16	42 1988	5 1976
Aug	182	164 1986	28 1987	23	75 1985	4 1974
Sep	67	126 1988	42 1986	26	115 1974	7 1976
Oct	218	263 1989	145 1988	52	126 1976	7 1978
Nov	151	264 1986	57 1988	76	177 1986	25 1975
Dec	171	253 1986	72 1988	98	140 1986	52 1988
Annual	1449	1649 1986	1243 1987	667	847 1986	446 1975

**Catchment Characteristics**

Catchment area ( $km^2$ )	20.8
Level stn. (mOD)	61.00
Max alt. (mOD)	520
IH Baseflow index	0.62
FSR slope ( $m/km$ )	34.96
1941-70 rainfall (mm)	1443
FSR stream freq. (junctions/ $km^2$ )	1.86
FSR percentage urban	0

**Station and Catchment Description**

**Factors Affecting Flow Regime**

**Summary of Archived Data**

**Gauged Flows and Rainfall**

Key:

All rain-fall	A	Some or no rain-fall	a	1970s	---aa	1980s	-----aAABA	1990s	aa
All daily, all peaks	A		b						
All daily, some peaks	B		c						
All daily, no peaks	C		d						
Some daily, all peaks	D		e						
Some daily, some peaks	E		f						
Some daily, no peaks	F		-						
No gauged flow date	-		-						

**Naturalised Flows**

Key:

All daily, all monthly	A	1970s	---FE	1980s	EEF
Some daily, all monthly	B				
Some daily, some monthly	C				
Some daily, no monthly	D				
No daily, all monthly	E				
No daily, some monthly	F				
No naturalised flow date	-				