

NORTH WESSEX ROUTINE SURVEY REPORT.
RIVER TONE 1994

1. Introduction.

1.1 This survey was conducted on four sites previously fished in 1984, 1986 and 1990 and was primarily concerned with salmonid species and their recruitment. Reference should be made to previous reports, and for this reason the 1994 report is fairly brief to avoid obvious repetition.

1.2 Topographical, geological and hydrological information has been included as this was last described in 1984.

2. Topography.

2.1 Upstream of French Weir at Taunton, the River Tone and its tributaries drain a catchment of approximately 290 square kilometres. The source of the Tone is Beverton Pond situated on the Brendon Hills near Raleighs Cross, 375 metres above sea level. Within 3 kilometres of the source the river is impounded to form Clatworthy Reservoir. From the dam the river flows due south in a steep sided valley which drains the south eastern corner of the Brendon Hills. Between Greenham and Wellisford the river changes course dramatically finally flowing eastward through more level countryside to the north of Wellington. Here the first large tributary, the Westford Stream, joins the main river.

2.2 Most of the countryside to the north of the main river drains into the Hillfarrance Brook, Halse Water or Back Stream. The Hillfarrance Brook too originates on the Brendon Hills, but flows south east through the Vale of Taunton Dean eventually joining the main river at Hele, 4 kilometres upstream of Taunton. The Halse water also rises on the Brendon Hills and follows a course parallel to that of the Hillfarrance Brook through the Vale of Taunton Dean. The Back Stream drains the south western slopes of the Quantock Hills. The Halse Water and Back Stream unite shortly before their combined flow joins the River Tone at Bishops Hull one kilometre upstream of Taunton.

3. Hydrology and Abstractions.

3.1 There are 2 gauging stations on the River Tone at Greenham and Bishops Hull and Greenham. Flow frequency analysis for the two sites are displayed on Appendix 3. The statutory release of compensation water from Clatworthy Reservoir reduces the effect of heavy rainfall on river flows during May to November, the period when the reservoir is normally below crest level.

3.2 There are approximately 54 abstraction licences for irrigation, water supply and industrial purposes within the catchment.

4. The Geology of the Catchment

4.1 The Tone headwaters drain steep-sided valleys in the Upper Devonian slates and sandstones of the Brendon Hills. These hard strata are mostly of low permeability and the upper Tone has been retained by a simple dam to form the Clatworthy Reservoir.



- 4.2 Near Holcombe Rogus the Tone emerges into less hilly country of softer rocks: Carboniferous shales and limestones and Permo-Triassic sandstones and conglomerates. The river makes two sharp bends where it was diverted from its ancient course, joining the Exe system, by a tributary of the Hillfarrance brook that was able to capture it by eroding its bed deeper into the softer strata.
- 4.3 From Wellington onwards to Taunton the left bank tributaries, the Hillfarrance, Halse and Back streams, drain extensive areas of Permo-Triassic sandstone and pebble beds. Of these the soft red Otter Sandstone in particular is an important aquifer that supplies much summer base flow to the river. The shorter right bank tributaries head in springs rising from the Upper Greensand of the Blackdown Hills and flow over soft clayey Triassic strata, the Mercia Mudstones, to the Tone.
- 4.4 Downstream from Wellington the Tone and its tributaries traverse alluvial flats that widen gradually into Curry Moor and Stan Moor, where the Tone joins the Parrett. On this last stretch of the river the flats are bordered by low hills of Mercia Mudstone, beyond which, on the north side, the longer tributary streams rise on Devonian slates at the south end of the Quantock Hills.

5. Water Quality

- 5.1 The main sewage works discharging to this watercourse are those serving Taunton and Wellington. There is no evidence of downgrading of water quality below Wellington though the quality class drops in the lowest reaches where the Taunton works outfalls. Although the Taunton works is downstream of the surveyed reaches it has significance for migratory fish.
- 5.2 In December 1992, there was a major slurry spillage at a farm at Ashbrittle which had an effect on the Tone as far down as Wellington though this was not long lasting. There was also a serious slurry pollution at a farm near Greenham in 1991, caused by a large tank failure.
- 5.3 In 1994 the Sherford stream suffered two serious incidents which killed fish including many trout. It was polluted firstly by a discharge caused by contractors working at Fulwood water treatment works. Later in the year a slurry discharge killed most fish in the stream though the effluent was suitably diluted by the Tone to cause no effect on the main river.
- 5.4 Also in 1994 the Three Bridges Stream was seriously polluted and many trout and other fish were killed. This incident was caused by a failure at a sewage pumping station which serves the M5 motorway Services.
- 5.5 Under the N.R.A's new General Quality Assessment classification of water quality the 1993 results are displayed in Table 1.

6 Survey Sites

- 6.1 Four sites were surveyed as shown on the attached map (Appendix 1). Table 2 shows the site details.

7.0 Survey Methods.

7.1 All four sites were isolated with stop nets and electric fished by wading upstream using pulsed DC at 600 cycles. All sites were fished three times to produce a quantitative estimate of fish numbers.

8.0 Results

8.1 Appendix 2 displays the estimated number, biomass and species caught. Figure 1 displays a comparison of numbers of brown trout captured on the different surveys between 1984 and 1994.

8.2 Figure 2 displays a comparison of the density of juvenile with adult Brown Trout, assuming that a 10cm cut off indicates juvenile fish.

9. Discussion.

9.1 Compared with previous surveys there was a small increase in the numbers of Brown Trout captured on three sites and a marked increase at one site, Hele Hill (TO10) as shown in Figure 1.

9.2 As has been noted in previous surveys, there is a distinct lack of juvenile Trout. There seems to be little evidence that natural recruitment is occurring within the surveyed stretch except by migration from nursery areas outside, as shown in Figure 2.

9.3 The most probable reason for the relatively large numbers of Trout captured at the site at Hele Hill (TO10) was a movement of fish out of the Three Bridges stream as a consequence of the pollution incident referred to above. This took place not long before the survey and the confluence of the affected stream with the Tone was immediately downstream of the survey site.

9.4 The site at Hornshay (TO1M) contained the largest number of species, but relatively low numbers of trout. The habitat was generally very shallow, and one would not expect large numbers of trout to be present.

9.5 Juvenile Salmon were captured at Hornshay and were the first young salmon to have been caught and positively identified in any fisheries survey of the River Tone.

9.6 Redd counting in previous years has revealed very large redds close to the site where the juvenile salmon were caught. Successful spawning could have been helped by the previous two winters of high flows. This would have assisted the salmon upstream and helped to loosen the gravel.

9.7 Adult salmon have been entering the Tone on a regular basis. Improvements in water quality mean that dead fish are no longer found in the river below Taunton as was the case twenty years ago. Salmon have also be seen more frequently above Taunton.

9.8 Until 1994 surveys have not revealed any grayling upstream of Bradford Weir. In 1994 the species was caught at both Trefusis (TO1N) and at Hornshay (TO1M). Again the high winter flows of the last two years may have enabled grayling to ascend the Weir and access this new reach in numbers.

9.9 The pollution incidents on the Sherford and Three Bridges Streams revealed that these two waters held far more brown trout than had been supposed and that both contained nursery areas.

10. Conclusion and Recommendations

10.1 The results of the survey appears to confirm recruitment problems. Given this situation and the extent to which fishing occurs it seems inevitable that some restocking is necessary if numbers of takeable fish are to be removed.

10.2 As has been mentioned in previous reports the gravels in the Tone are generally compacted and may benefit from a loosening programme.

10.3 The presence of salmon was encouraging and the provision of further fish passes at Hornshay and Fox Bros would remove the remaining major obstruction to fish movement on the River Tone.

TABLE 1

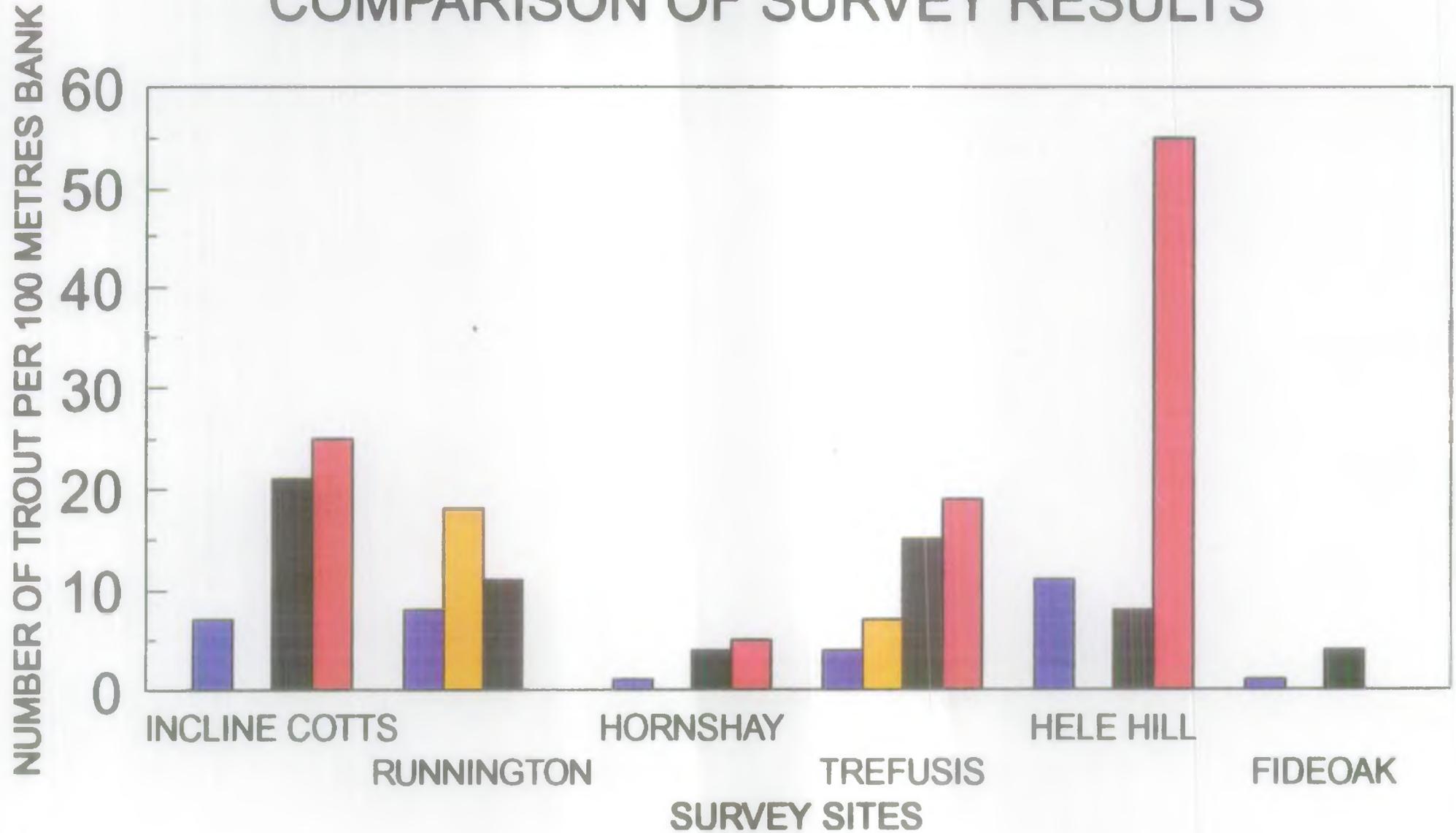
| Stretch | Site NGR | Class |
|---------------------------------------|--------------|-------|
| U/S Clatworthy Res D/S Clatworthy Res | ST 046 312 | B |
| D/S Clatworthy Res-Milton | ST 046 312 | B |
| Milltown-Huish Champflower | ST 048 310 | B |
| Huish Champflower-Chipstable | ST 053 286 | B |
| Chipstable-West Bovey | ST 052 254 | B |
| West Bovey-Stawley | ST 052 254 | B |
| Stawley Greenham | ST 078 202 | B |
| Greenham-Runnington | ST 078 202 | B |
| Runnington-Conf with Westford Stream | ST 078 202 | B |
| Conf with Westford Str-Fox Bros | ST 126 219 | B |
| Fox Bros-Wellington STW | ST 129 221 | B |
| Wellington STW-Poole | ST 142 224 | B |
| Poole-Conf with Hywards Water | ST 155 223 | B |
| Conf with Haywards WTr-Norton Hayes | ST 172 230 | B |
| Norton Hayes-Conf with Hele | ST 1765 2370 | B |

TABLE 2

| NAME: | T01K | T01M | T01N | T01O |
|-----------|----------|----------|----------|----------|
| CODE: | T01K | T01M | T01N | T01O |
| DATE: | 08/09/94 | 09/09/94 | 01/09/94 | 31/08/94 |
| WIDTH(M) | 8.2 | 7.7 | 7.2 | 6.4 |
| LENGTH(M) | 114 | 96 | 110 | 96 |
| DEPTH(M) | 1.1 | 1.2 | 1.4 | 1.2 |
| AREA(HA) | 0.093 | 0.074 | 0.079 | 0.061 |
| WEED (Z) | 35 | 6 | 88 | 54 |
| SHADE(Z) | 0 | 0 | 0 | 0 |

RIVER TONE: BROWN TROUT

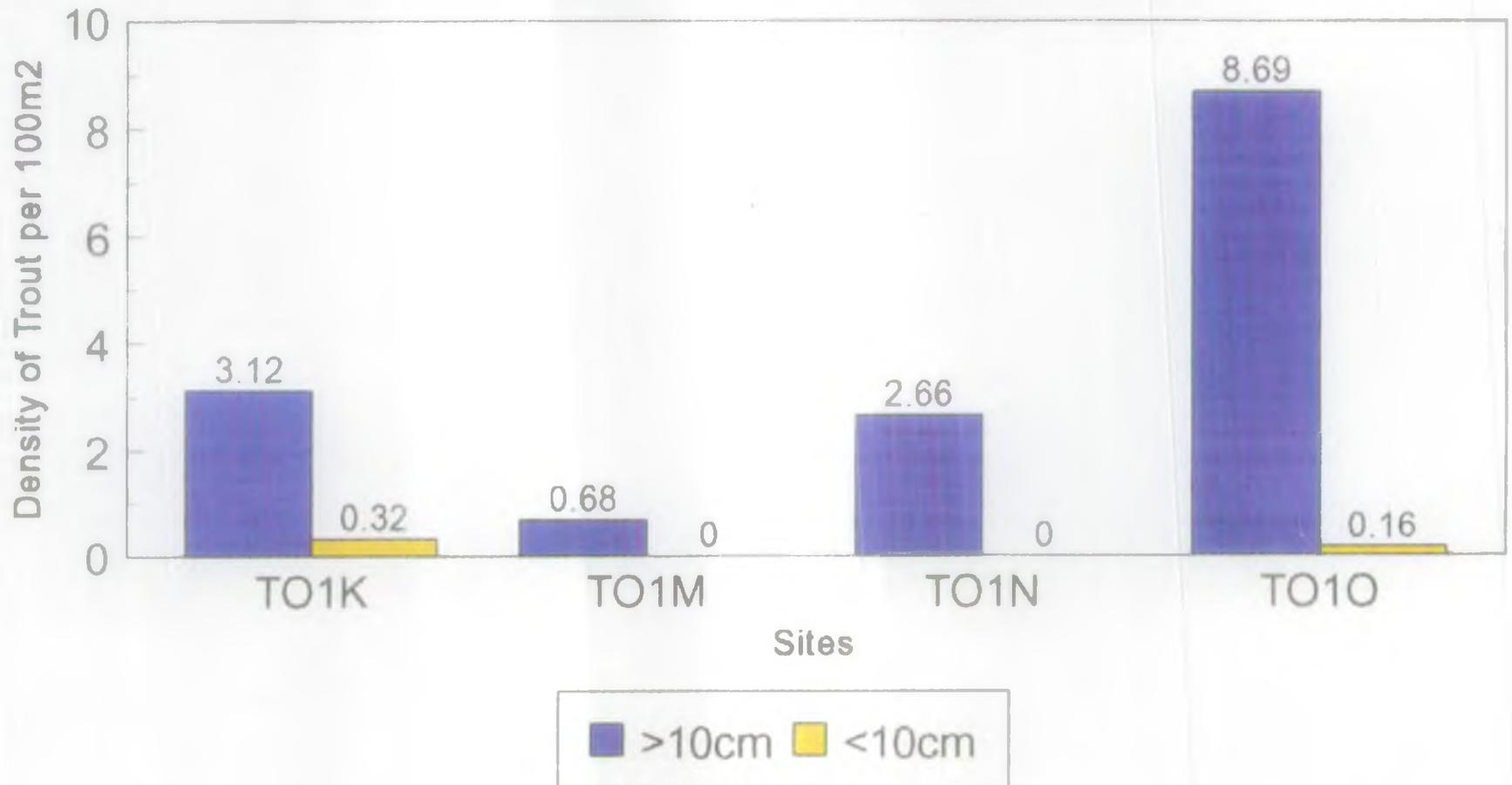
COMPARISON OF SURVEY RESULTS



8/1984 10/1986 4/1990 9/1994

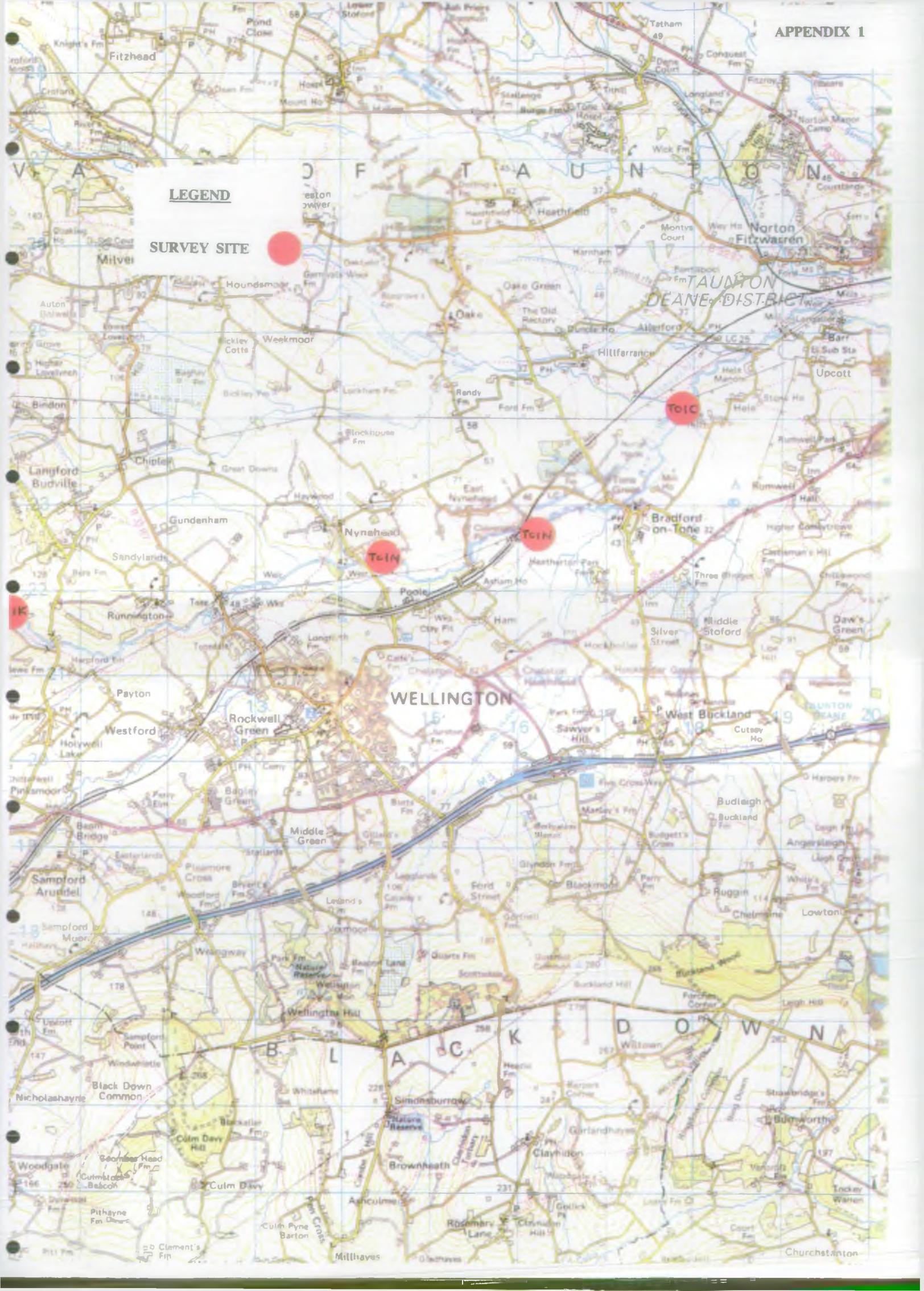
River Tone

Density of Trout >10cm and <10cm



LEGEND

SURVEY SITE



WELLINGTON

TAUNTON
DEANE DISTRICT

J F T A U N T O N

V A

B L A C K D O W N

| SPECIES | EST POPULATION >10 cm | BIOMASS>10 cm gms/100m2 | DENSITY>10 cm per 100m2 | POPULATION METHOD | PROBABILITY OF CAPTURE | BIOMASS<10 cm gms/100m2 | DENSITY<10 cm per 100m2 | MEAN WEIGHT (gms) | MEAN CONDITION FACTOR |
|---|--------------------------|----------------------------|----------------------------|----------------------|---------------------------|----------------------------|----------------------------|----------------------|--------------------------|
| TO1K INCLINE COTTAGES, ST101218, 8/9/94 | | | | | | | | | |
| BULLHEAD | 0 | 0 | 0 | 4 | 0 | 27.31 | 11.40 | | |
| BROWN TROUT | 29 | 490.82 | 3.12 | 3 | 0.51 | 3.65 | 0.32 | 157.40 | 1.28 |
| EEL | 10 | 140.11 | 1.08 | 3 | 0.45 | 0 | 0 | 130.30 | 0.15 |
| BROOK LAMPREY | 4 | 1.72 | 0.43 | 3 | 0.44 | 0 | 0 | | |
| MINNOW | 0 | 0 | 0 | 4 | 0 | 42.47 | 12.05 | | |
| STONELOACH | 0 | 0 | 0 | 4 | 0 | 28.68 | 3.34 | | |
| TOTALS | | 632.65 | 4.62 | | | 99.99 | 27.11 | | |
| TO1M HORNSHAY, ST145224, 8/9/94 | | | | | | | | | |
| BULLHEAD | 0 | 0 | 0 | 4 | 0 | 3.65 | 0.81 | | |
| BROWN TROUT | 6 | 237.18 | 0.68 | 3 | 0.71 | 0 | 0 | 351.00 | 1.27 |
| DACE | 6 | 100.14 | 0.81 | 3 | 0.67 | 0 | 0 | 123.50 | 1.58 |
| EEL | 2 | 77.57 | 0.27 | 3 | 0.67 | 0 | 0 | | |
| GRAYLING | 2 | 44.05 | 0.27 | 3 | 0.67 | 1.62 | 0.14 | | |
| GUDGEON | 1 | 5.95 | 0.14 | 3 | 1.00 | 0 | 0 | | |
| MINNOW | 0 | 0 | 0 | 4 | 0 | 89.32 | 29.38 | | |
| ROACH | 2 | 22.16 | 0.27 | 3 | 1.00 | 0 | 0 | | |
| SALMON | 2 | 17.57 | 0.27 | 3 | 0.67 | 0 | 0 | | |
| STONELOACH | 0 | 0 | 0 | 4 | 0 | 61.62 | 6.11 | | |
| TOTALS | | 504.69 | 2.70 | | | 166.21 | 37.43 | | |
| TO1N TREFUSIS FARM, ST162226, 1/9/94 | | | | | | | | | |
| BULLHEAD | 0 | 0 | 0 | 4 | 0 | 4.58 | 0.76 | | |
| BROWN TROUT | 21 | 615.91 | 2.66 | 3 | 0.81 | 0 | 0 | 231.70 | 1.27 |
| EEL | 18 | 269.16 | 2.03 | 3 | 0.87 | 0 | 0 | 132.90 | 0.23 |
| GRAYLING | 9 | 217.25 | 1.14 | 3 | 0.89 | 0 | 0 | 190.70 | 1.24 |
| STONELOACH | 1 | 1.27 | 0.13 | 3 | 1.00 | 68.58 | 9.62 | | |
| MINNOW | 0 | 0 | 0 | 4 | 0 | 62.91 | 22.91 | | |
| TOTALS | | 1103.60 | 6.95 | | | 134.06 | 33.29 | | |
| TO1O HELE HILL, ST179242, 31/8/94 | | | | | | | | | |
| BROWN TROUT | 63 | 1172.95 | 8.69 | 3 | 0.56 | 1.80 | 0.18 | 135.00 | 1.22 |
| DACE | 8 | 163.02 | 1.31 | 3 | 1.00 | 0 | 0 | 124.30 | 1.48 |
| EEL | 3 | 22.62 | 0.49 | 3 | 1.00 | 0.82 | 0.16 | | |
| GRAYLING | 6 | 155.90 | 0.98 | 3 | 0.87 | 0 | 0 | 158.60 | 1.22 |
| PI | 1 | 61.80 | 0.16 | 3 | 1.00 | 0 | 0 | | |
| STONELOACH | 3 | 8.02 | 0.49 | 3 | 0.75 | 7.57 | 0.98 | | |
| MINNOW | 0 | 0 | 0 | 4 | 0 | 40.49 | 20.66 | | |
| BULLHEAD | 0 | 0 | 0 | 4 | 0 | 30.33 | 16.89 | | |
| TOTALS | | 1584.31 | 12.13 | | | 81.02 | 38.85 | | |



Tone at Bishops Hull

Measuring Authority: NRA - Wessex
 Grid Reference: 31 (ST) 206 250
 Station Type: C VA

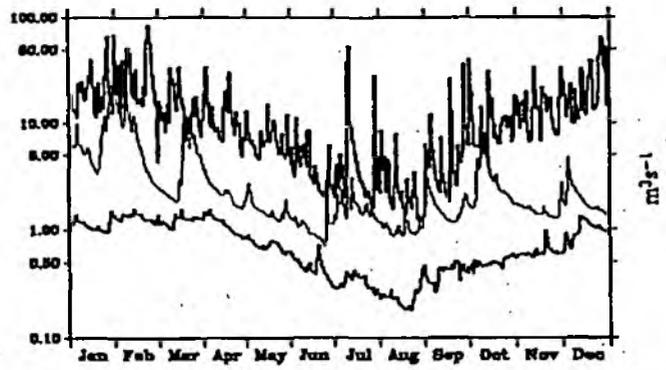
Gauged Flows and Rainfall: 1961-1992
 IH Station Number: 052005
 Local Number: 052005

APPENDIX 3

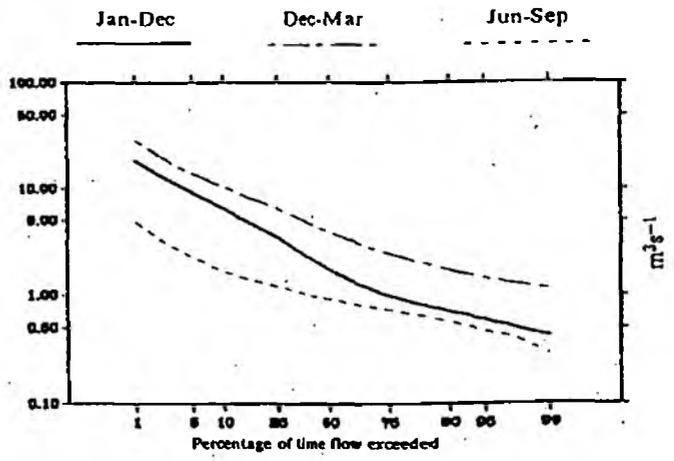
Surface Water Archive
 Data Retrieval Service

Daily Flow Hydrograph

Max. and min. daily mean flows from 1961 to 1992 excluding those for the featured year (1988)



Flow Duration Curve



Flow Statistics

(Units: m³s⁻¹ unless otherwise stated)

| | |
|--|-------------------|
| Mean flow | 2.99 |
| Mean flow (ls ⁻¹ /km ²) | 14.80 |
| Mean flow (10 ⁶ m ³ /yr) | 94.5 |
| Peak flow / date | 112.7 11 Jul 1968 |
| Highest daily mean / date | 84.2 23 Feb 1978 |
| Lowest daily mean / date | 0.179 22 Aug 1976 |
| 10 day minimum / end date | 0.190 23 Aug 1976 |
| 60 day minimum / end date | 0.279 28 Aug 1976 |
| 240 day minimum / end date | |
| 10% exceedance (Q10) | 6.530 |
| 50% exceedance (Q50) | 1.761 |
| 95% exceedance (Q95) | 0.601 |
| Mean annual flood | 63.3 |
| Bankfull flow | |
| IH Baseflow index | 0.58 |

Rainfall and Runoff

| | Rainfall (1961-1991) mm | | | Runoff (1961-1992) mm | | |
|------|-------------------------|-----------|----------|-----------------------|----------|----------|
| | Mean | Max/Yr | Min/Yr | Mean | Max/Yr | Min/Yr |
| Jan | 114 | 250 1984 | 25 1964 | 79 | 193 1984 | 17 1976 |
| Feb | 84 | 194 1990 | 6 1965 | 73 | 170 1990 | 21 1965 |
| Mar | 84 | 170 1981 | 5 1961 | 57 | 123 1981 | 21 1962 |
| Apr | 62 | 150 1966 | 6 1984 | 38 | 85 1966 | 15 1976 |
| May | 63 | 137 1983 | 9 1991 | 27 | 87 1983 | 10 1976 |
| Jun | 60 | 147 1980 | 8 1962 | 17 | 36 1972 | 6 1976 |
| Jul | 59 | 144 1965 | 16 1976 | 15 | 75 1968 | 4 1976 |
| Aug | 67 | 126 1985 | 19 1991 | 12 | 22 1965 | 4 1976 |
| Sep | 80 | 202 1974 | 8 1971 | 15 | 63 1974 | 6 1964 |
| Oct | 94 | 249 1976 | 8 1978 | 26 | 131 1976 | 8 1978 |
| Nov | 96 | 192 1984 | 31 1988 | 42 | 98 1982 | 8 1978 |
| Dec | 111 | 205 1965 | 34 1988 | 67 | 150 1965 | 24 1975 |
| Year | 974 | 1191 1974 | 708 1964 | 467 | 637 1974 | 250 1964 |

Catchment Characteristics

| | | |
|-------------------------------|------------------------------|-------|
| Catchment Area | (km ²) | 202.0 |
| Level station | (mOD) | 16.20 |
| Max altitude | (mOD) | 409 |
| FSR slope (SL1085) | (m/km) | 5.60 |
| 1941-70 rainfall (SAAR) | (mm) | 995 |
| FSR stream frequency (STMFRQ) | (junctions/km ²) | 0.72 |
| FSR percentage urban (URBAN) | | 0 |

Station and Catchment Description

Pre 3/68 velocity-area station; flows unreliable below 1.42 cumec. Now Crump profile weir (breadth 12.2m) with crest tapping (not operational). Full range station. Clatworthy and smaller Luxhay Reservoir in headwaters. Compensation flow maintains low flows. Reservoirs not large enough to influence fairly rapid response to rainfall. Minor surface water abstractions for PWS.

Catchment geology - predominantly sandstones and marls. Land use - rural.

Factors Affecting Runoff

- Reservoir(s) in catchment affect runoff.
- Runoff reduced by public water supply abstraction.

Summary of Archived Data

| Gauged Flows and Rainfall | | | 01234 56789 |
|---------------------------|-------|-------|-------------|
| 1960s | -EAAA | AAAAA | |
| 1970s | AAAAA | AAAAA | |
| 1980s | AAAAA | AAAAA | |
| 1990s | AAe | | |

| Key: | | |
|------------------------|---|---|
| All daily, all peaks | A | a |
| All daily, some peaks | B | b |
| All daily, no peaks | C | c |
| Some daily, all peaks | D | d |
| Some daily, some peaks | E | e |
| Some daily, no peaks | F | f |
| No gauged flow data | - | - |

| Naturalised Flows | | | 01234 56789 |
|-------------------|--------|--------|-------------|
| 1960s | -FEEE | EEEEEE | |
| 1970s | EEEEEE | EEF | |

| Key: | | |
|--------------------------|---|--|
| All daily, all monthly | A | |
| 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 data | - | |