Bournemouth University

Bournemouth University Global Environmental Solutions

Macroinvertebrate, fish population and spawning surveys in six New Forest streams, September – December 2017

Higher Level Stewardship Agreement

The Verderers of the New Forest AG00300016

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EXECUTIVE SUMMARY

Wetland restoration in the New Forest has been undertaken for decades. The current programme of works, under the Higher Level Stewardship scheme's main objectives, is to bring the New Forest riverine and wetland habitat to Favourable Condition, in accordance with its statutory designation as a Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC).

This data report summarises the findings of electric fishing surveys, macroinvertebrate surveys and redd count surveys at nine locations (in six different streams).

Surveys were undertaken at Latchmore Brook, Linford Brook, Millersford Brook, South Oakley (Black Water), Wootton Phase 1 (Avon Water), Wootton Phase 2 (Avon Water), Slufters (Bratley Water), Dames Slough (Black Water) and Rhinefield (Black Water).

In accordance with Forestry Commission request; the report comprises a record of survey data only, with a view to informing longer-term fish and macroinvertebrate population datasets aimed at tracking post-restoration ecological recovery.

Key findings are presented below:

FISH POPULATION SURVEYS

Table 1 summarises the fish species recorded at each location (in numerical abundance order).

Table 1. Species recorded at each location.

Location	Year restoration undertaken / planned	Fish species recorded
Dames Slough Site 1	2005	Minnow, stoneloach, bullhead, river/brook lamprey, brown trout
Dames Slough Site 2	2005	Stoneloach, bullhead, minnow, pike, river/brook lamprey
Latchmore Brook Site 1	No plan to restore	Minnow, chub, stoneloach, perch, eel
Latchmore Brook Site 2	No plan to restore	Minnow, chub, stoneloach, brown trout, eel
Millersford Brook Site 1	2018	No fish captured
Millersford Brook Site 2	No plan to restore	Brown trout, eel
Millersford Brook Site 3	No plan to restore	Brown trout
Rhinefield	2003 – 2006	Stoneloach, bullhead, minnow, pike, brown trout, river/brook lamprey
Slufters	2014	Minnow, stoneloach, bullhead, brown trout, river/brook lamprey
Wootton Phase 1 Site 1	2016	Brown trout, minnow, bullhead, stoneloach, river/brook lamprey, 3-spined stickleback
Wootton Phase 1 Site 2	2017	Brown trout, bullhead, minnow, lamprey
Wootton Phase 2	2018	Brown trout, stoneloach, bullhead, minnow, gudgeon, river/brook lamprey

MACROINVERTEBRATE SURVEYS

Table 2 presents the lowest Observed/Expected ratios of biotic indices at each location.

Table 2. Lowest Observed / Expected ratios of biotic indices at each location.

Location	Year restoration undertaken / planned	Observed / Expected ratios of key biotic indices
Latchmore Brook Site 1	No plan to restore	Moderately degraded
Latchmore Brook Site 2	No plan to restore	Slightly degraded
Millersford Brook Site 1	2018	Moderately degraded
Millersford Brook Site 2	No plan to restore	Within expected range
Millersford Brook Site 3	No plan to restore	Within expected range
Slufters	2014	Slightly degraded
Wootton Phase 1 Site 1	2016	Moderately degraded
Wootton Phase 1 Site 2	2017	Within expected range
Wootton Phase 2	2018	Moderately degraded

REDD COUNT SURVEYS

Table 3 summarises the number of redds recorded at each location.

Table 3. Number of redds recorded at each location.

Location	Year restoration undertaken / planned	Number of redds recorded	
		Sea trout	Resident brown trout
Dames Slough	2005	5	2
Latchmore Brook	No plan to restore	1	3
Linford Brook	No plan to restore	1	1
Millersford Brook	2018 (Site 1 only)	0	0
Rhinefield	2003 – 2006	10	3
Slufters	2014	0	1
South Oakley	2003 – 2006	2	0
Wootton Phase 1	2016 (Site 1), 2017 (Site2)	6	5
Wootton Phase 2	2018	15	5

1. INTRODUCTION

The New Forest HLS scheme objectives are to restore resectioned channels to their historic meanders to prevent further erosion of the specialist more / wet heath habitats, increase the availability of in-channel habitat and reconnect the flooplain, with a view to bringing the SSSI units back into Favourable Condition according to their conservation objectives. The scheme is a catchment-based approach of naturalising and sustaining the landscape into the future, maintaining grazing and the complex biodiversity of the New Forest open habitats.

Geo- and hydromorphological restoration of flowing water bodies are widely regarded as being of positive environmental benefit; however, this can be difficult to justify to local land owners, interest groups and other organisations without sound supporting evidence. This project has been designed to focus on freshwater fish and macroinvertebrate communities as indicators of ecological quality and to detect whether any temporal changes in community structure (positive or negative) can be attributed to the physical re-engineering of stream profiles.

This data report summarises the findings of electric fishing surveys, macroinvertebrate surveys and redd count surveys at nine locations (in six different streams).

Surveys were undertaken at Latchmore Brook, Linford Brook, Millersford Brook, South Oakley (Black Water), Wootton Phase 1 (Avon Water), Wootton Phase 2 (Avon Water), Slufters (Bratley Water), Dames Slough (Black Water) and Rhinefield (Black Water).

1.1 Aims and objectives

The specific aims and objectives of this report are as follows:

- Provide fish and macroinvertebrate survey data for the selected New Forest streams.
- Highlight any rare species afforded conservation protection under the following designations:
    - Schedule 5 Wildlife and Countryside Act (1981) Species
    - Red Data Book Species
    - UK BAP Priority Species
    - Nationally and Regionally Scarce Species

Note: This work is delivered under Call-Off Contract 1 under Framework 304/NF/16/1326 Specialist Ecological Surveys.

2. METHODOLOGY

2.1 Site selection

In advance of the surveys being undertaken, the Forestry Commission provided BUG with National Grid Reference coordinates for the upstream and downstream extent of the area of interest, along with details of the survey requirements at each location (Table 2.1).

The extent of the area of interest for each location was mapped in ArcGIS, to provide an overview of the location of each area of interest in relation to the wider catchment (Figure 2.1). In addition, potential downstream barriers to fish migration (e.g. weirs, sluices) were also mapped, taken from the 2013 Environment Agency Obstruction Database.

Table 2.1. Upstream and downstream limits of area of interest, and survey effort, at each location.

Location	Upstream extent of area of interest	Downstream extent of area of interest	Length of area of interest (km)	Fish survey site	Invert survey	Redd count
Dames Slough Inclosure (Black Water)	SU24080507	SU25370480	2.0	SU2412305020	No	Yes
				SU2497905012	No	
Latchmore Brook	SU22761595	SU18151242	6.4	SU1911412660	Yes	Yes
				SU1817512460	Yes	
Linford Brook	SU19530832	SU18240735	1.8	N/A	No	Yes
Millersford Brook	SU19951680	SU18231610	2.2	SU1951816719	Yes	Yes
				SU1838416240	Yes	
				SU1907116841	Yes	
Rhinefield (Black Water)	N/A	N/A	1.1	SU2612904593	No	Yes
Slufters (Bratley Water)	SU23091146	SU23140978	1.8	SU2314009780	Yes	Yes
South Oakley (Black Water)	SU22140591	SU23450529	1.5	N/A	No	Yes
Wootton Phase 1 (Avon Water)	SU23860030	SZ24969969	1.3	SU2324600438	Yes	Yes
				SZ2500699679	Yes	
Wootton Phase 2 (Avon Water)	SZ25109966	SZ26449873	1.6	SZ2638498168	Yes	Yes
TOTAL			**19.7**	**12**	**9**	**9**

Further details on the extent of the area of interest and the location of fish survey sites are provided in Sections 2.1.1 to 2.1.7 below. A more detailed description of site characteristics is provided within the introduction to each site in the results Section 3.

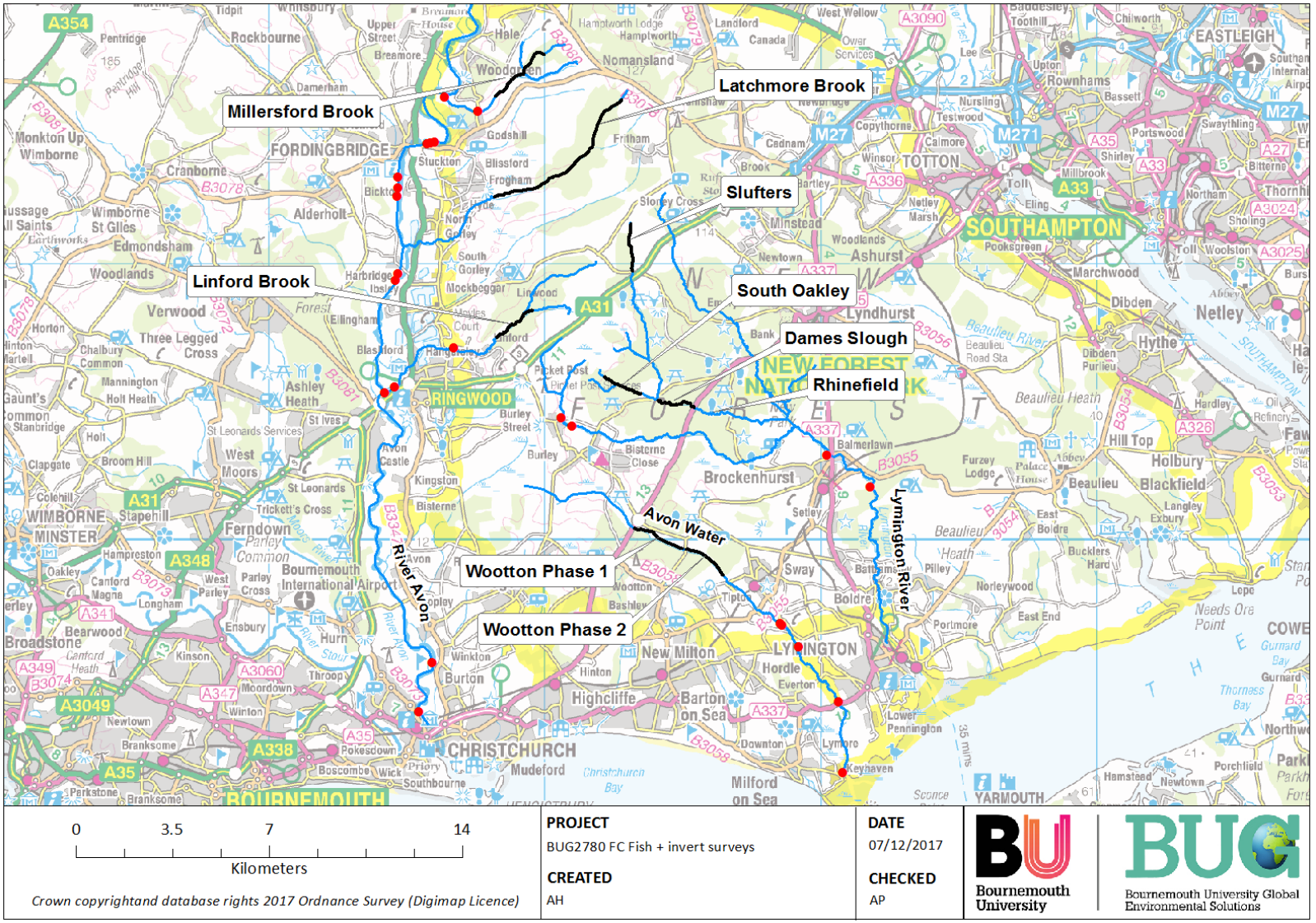

Figure 2.1. Extent of area of interest at each location. Obstacles listed in the EA barrier database are shown as red dots.

2.1.1 Dames Slough

Dames Slough Inclosure is located on the Black Water, a small tributary of the Lymington River (Figure 2.1). There are two obstacles listed in the EA barrier database located downstream of the area of interest; however, the passability of these obstacles to fish is unknown.

The area of interest, shown in Figure 2.2, has a total length of 2.0 km. Two fish sites were surveyed at this location. The upstream and downstream extents of the 100 m electric fishing sites (blue dots) are shown in Figure 2.2 and summarised in Table 2.2. A full description of the survey sites are provided within the results Sections 3.1 and 3.2.

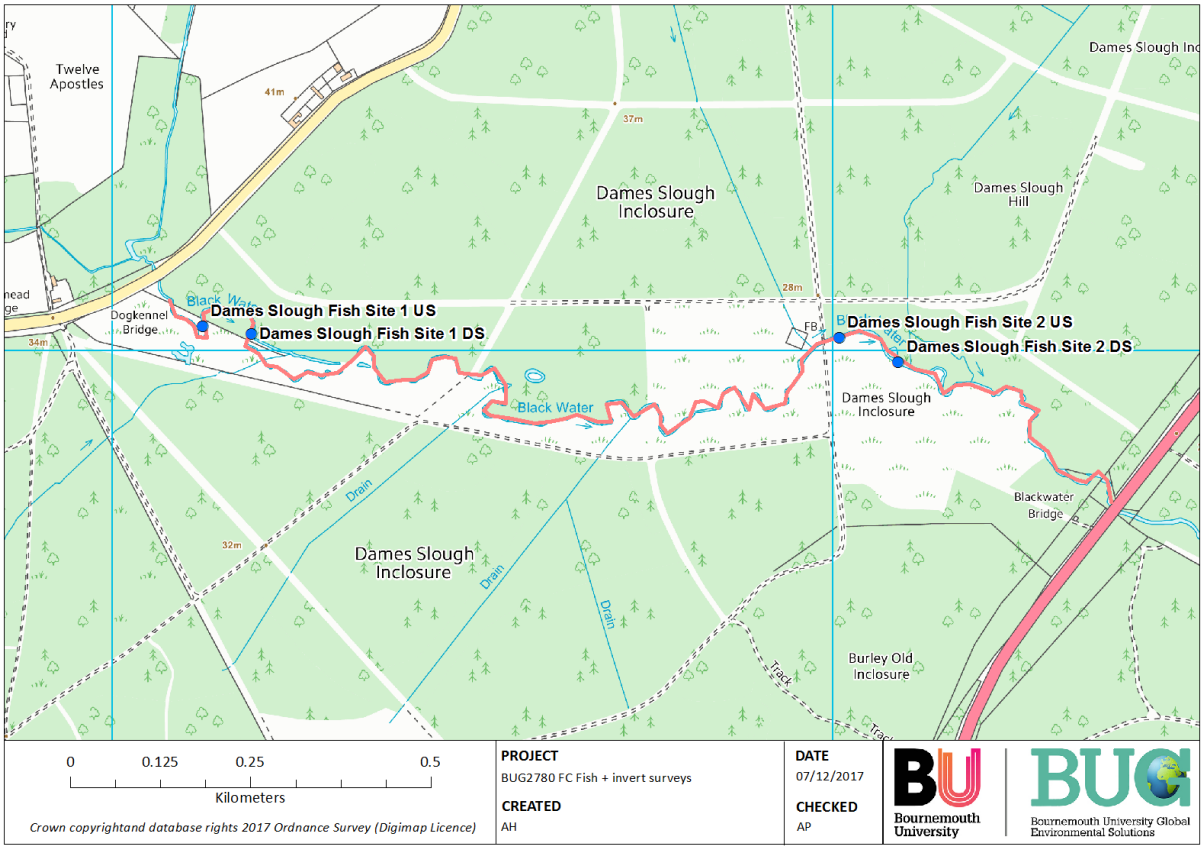

Figure 2.2. Upstream and downstream extent of survey areas at Dames Slough Inclosure. Extent of area of interest is shown in pink shading.

Table 2.2. Upstream and downstream limits of survey sites at Dames Slough Inclosure.

Site	Upstream extent of survey area	Downstream extent of survey area	Length of survey area (m)	Date of survey
Dames Slough Fish Site 1	SU2412605034	SU2419405024	100	19/09/2017
Dames Slough Fish Site 2	SU2500905019	SU2509104985	100	19/09/2017

2.1.2 Latchmore Brook

Latchmore Brook (changing downstream to Huckles Brook) is a small tributary of the River Avon (Figure 2.1). There are a total of four obstacles listed in the EA barrier database located downstream of the area of interest; however, the passability of these obstacles to fish is unknown.

The area of interest, shown in Figure 2.3, has a total length of 6.4 km (to the top of the catchment). Two sites were surveyed within the area of interest at this location. The upstream and downstream extents of the 100 m electric fishing sites (blue dots) and invertebrate kick-sampling sites (green dots) are shown in Figure 2.3 and summarised in Table 2.3. A full description of the survey sites are provided within the results Sections 3.3 and 3.4.

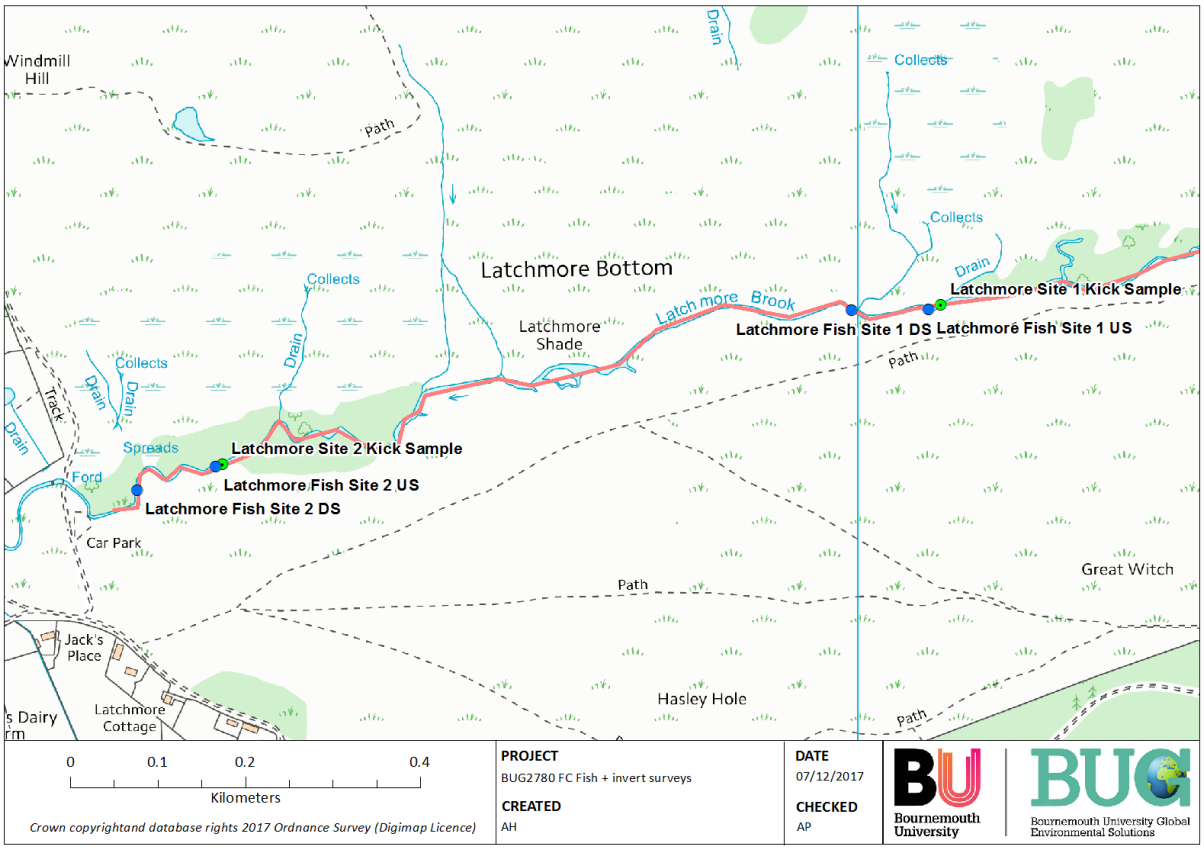

Figure 2.3. Upstream and downstream extent of survey areas at Latchmore Brook. Extent of area of interest is shown in pink shading. NOTE: Area of interest continues to top of catchment.

Table 2.3. Upstream and downstream limits of survey sites at Latchmore Brook.

Site	Upstream extent of survey area	Downstream extent of survey area	Length of survey area (m)	Date of survey
Latchmore Fish Site 1	SU1908112649	SU1899312648	100	12/09/2017
Latchmore Fish Site 2	SU1826712470	SU1817712443	100	12/09/2017
Latchmore Site 1 Kick Sample	SU1909612654	N/A	N/A	12/09/2017
Latchmore Site 2 Kick Sample	SU1827512472	N/A	N/A	12/09/2017

2.1.3 Linford Brook

Linford Brook is a tributary of the River Avon (Figure 2.1). There are a total of five obstacles listed in the EA barrier database located downstream of the area of interest; however, the passability of these obstacles to fish is unknown.

The area of interest, shown in Figure 2.4, has a total length of 1.8 km. Electric fishing and invertebrate kick-sampling were not undertaken at this location. A redd count survey was undertaken over the full length of the area of interest.

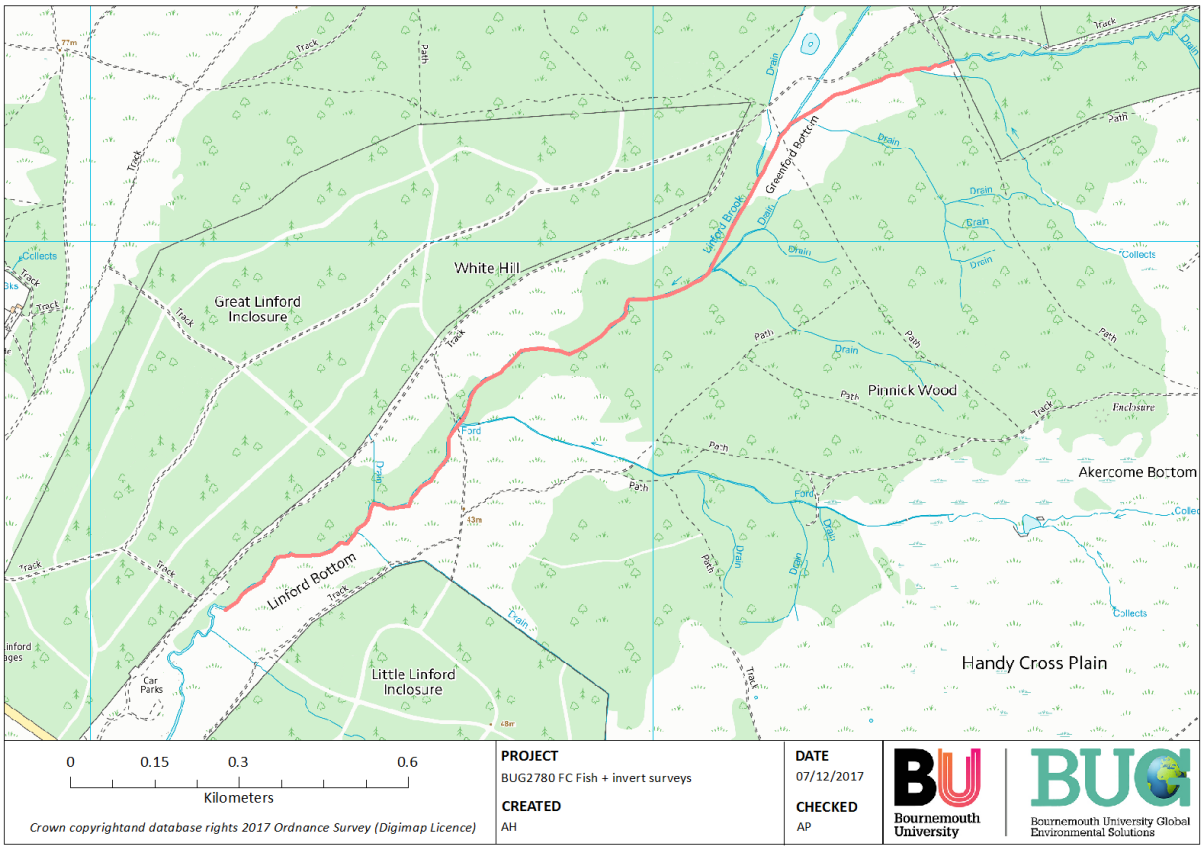

Figure 2.4. Extent of area of interest and redd count survey in Linford Brook, shown in pink shading.

2.1.4 Millersford Brook

Millersford Brook is a tributary of the River Avon (Figure 2.1). There are a total of 12 obstacles listed in the EA barrier database located downstream of the area of interest; however, the passability of these obstacles to fish is unknown.

The area of interest, shown in Figure 2.5, has a total length of 2.2 km. Three sites were surveyed at this location; one near the upstream extent of the area of interest (Millersford Brook Site 1), one toward the downstream extent (Millersford Brook Site 2) and one near the mid-point of the area of interest (Millersford Brook Site 3). The upstream and downstream extents of the three 100 m electric fishing sites (blue dots) and three invertebrate kick-sampling sites (green dots) are shown in Figure 2.5 and summarised in Table 2.4. Full descriptions of the survey sites are provided within the results Sections 3.5 to 3.7.

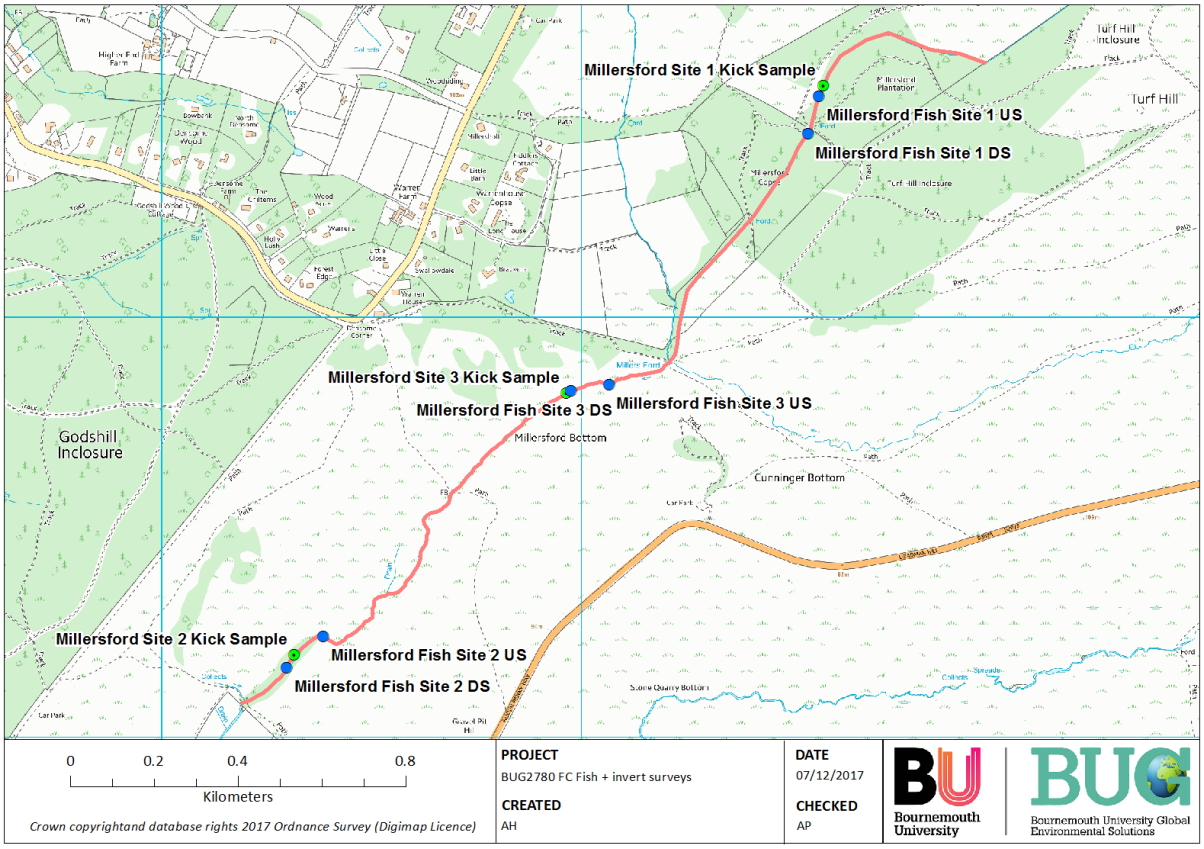

Figure 2.5. Upstream and downstream extent of survey areas at Millersford. Extent of area of interest is shown in pink shading.

Table 2.4. Upstream and downstream limits of fish survey sites at Millersford Brook.

Site	Upstream extent of survey area	Downstream extent of survey area	Length of survey area (m)	Date of survey
Millersford Fish Site 1	SU1956517527	SU1953917437	100	14/09/2017
Millersford Fish Site 2	SU1838416241	SU1829716167	100	13/09/2017

Site	Upstream extent of survey area	Downstream extent of survey area	Length of survey area (m)	Date of survey
Millersford Fish Site 3	SU1906516840	SU1897516825	100	14/09/2017
Millersford Site 1 Kick Sample	SU1957717553	N/A	N/A	14/09/2017
Millersford Site 2 Kick Sample	SU1831816197	N/A	N/A	13/09/2017
Millersford Site 3 Kick Sample	SU1896616820	N/A	N/A	14/09/2017

2.1.5 Rhinefield

Rhinefield is located on the Black Water, a small tributary of the Lymington River (Figure 2.1). There are two obstacles listed in the EA barrier database located downstream of the area of interest; however, the passability of these obstacles to fish is unknown.

The extent of the area of interest at this location is unknown. A single electric fishing survey was undertaken at this location. The upstream and downstream extents of the 100 m electric fishing site are shown in Figure 2.6 and summarised in Table 2.5. A full description of the survey site is provided within the results Section 3.8.

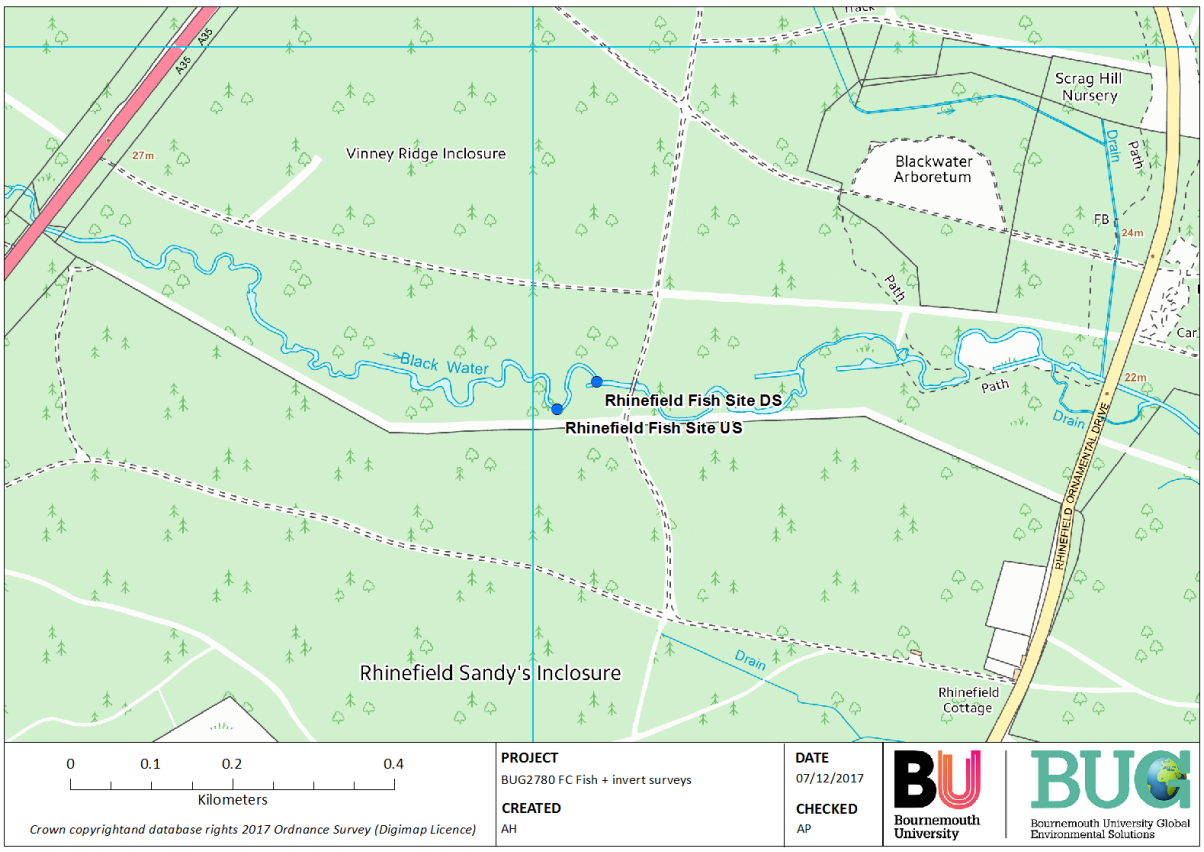

Figure 2.6. Upstream and downstream extent of survey area at Rhinefield.

Table 2.5. Upstream and downstream limits of fish survey site at Rhinefield.

Site	Upstream extent of survey area	Downstream extent of survey area	Length of survey area (m)	Date of survey
Rhinefield Fish Site	SU2607904589	SU2603004555	100	20/09/2016

2.1.6 Slufters

Slufters is located on the Bratley Water, a small tributary of the Black Water which flows into the Lymington River (Figure 2.1). There are two obstacles listed in the EA barrier database located downstream of the area of interest; however, the passability of these obstacles to fish is unknown.

The area of interest, shown in Figure 2.7, has a total length of 1.8 km. One site was surveyed at this location, situated toward the downstream extent of the area of interest. The upstream and downstream extents of the 100 m electric fishing site (blue dots) and invertebrate kick-sampling site (green dot) are shown in Figure 2.7 and summarised in Table 2.6. A full description of the survey site is provided within the results Section 3.9.

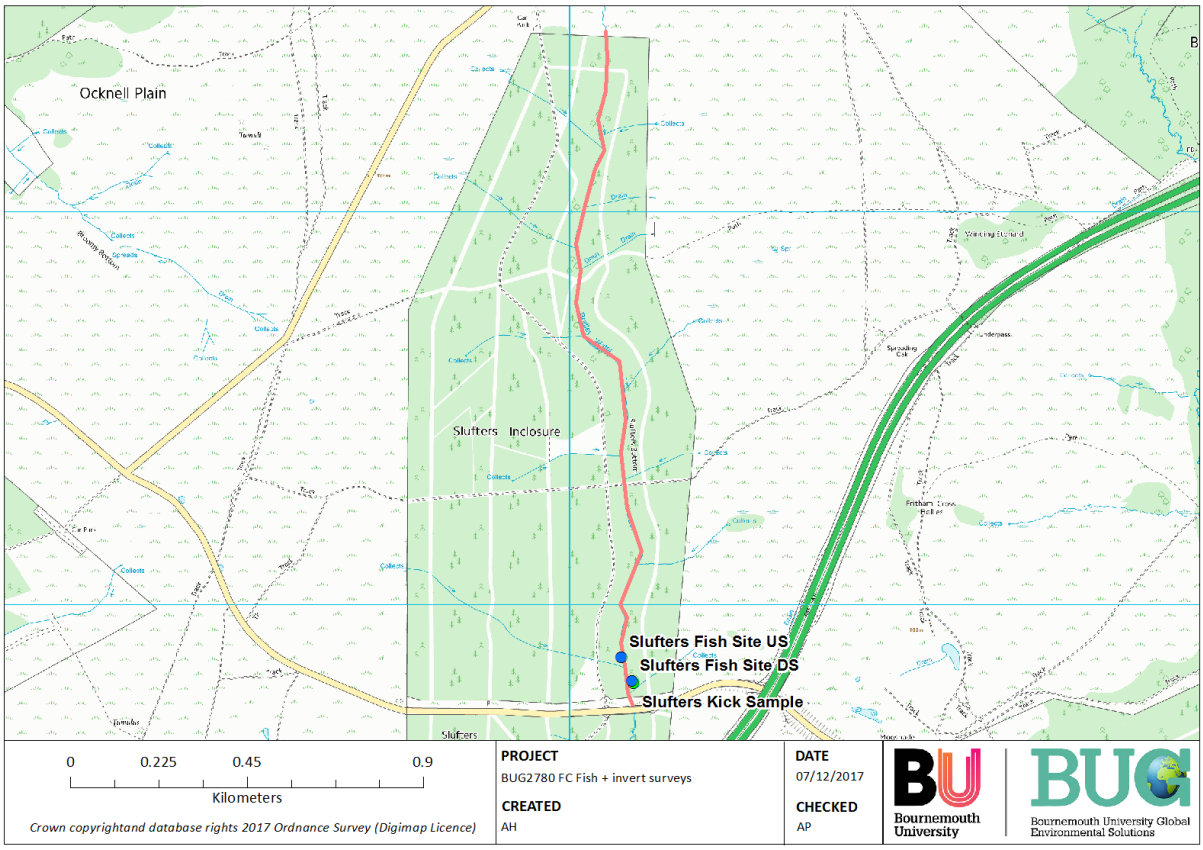

Figure 2.7. Upstream and downstream extent of survey area at Slufters. Extent of area of interest is shown in pink shading.

Table 2.6. Upstream and downstream limits of fish survey site at Slufters.

Site	Upstream extent of survey area	Downstream extent of survey area	Length of survey area (m)	Date of survey
Slufters Fish Site	SU2313209868	SU2315909807	100	13/09/2017
Slufters Kick Sample Site	SU2316409801	N/A	N/A	13/09/2017

2.1.7 South Oakley

South Oakley is located on the Blackwater, a small tributary of the Lymington River (Figure 2.1). There are two obstacles listed in the EA barrier database located downstream of the area of interest; however, the passability of these obstacles to fish is unknown.

The area of interest, shown in Figure 2.8, has a total length of 1.5 km. Electric fishing and invertebrate kick-sampling were not undertaken at this location. A redd count survey was undertaken over the full length of the area of interest.

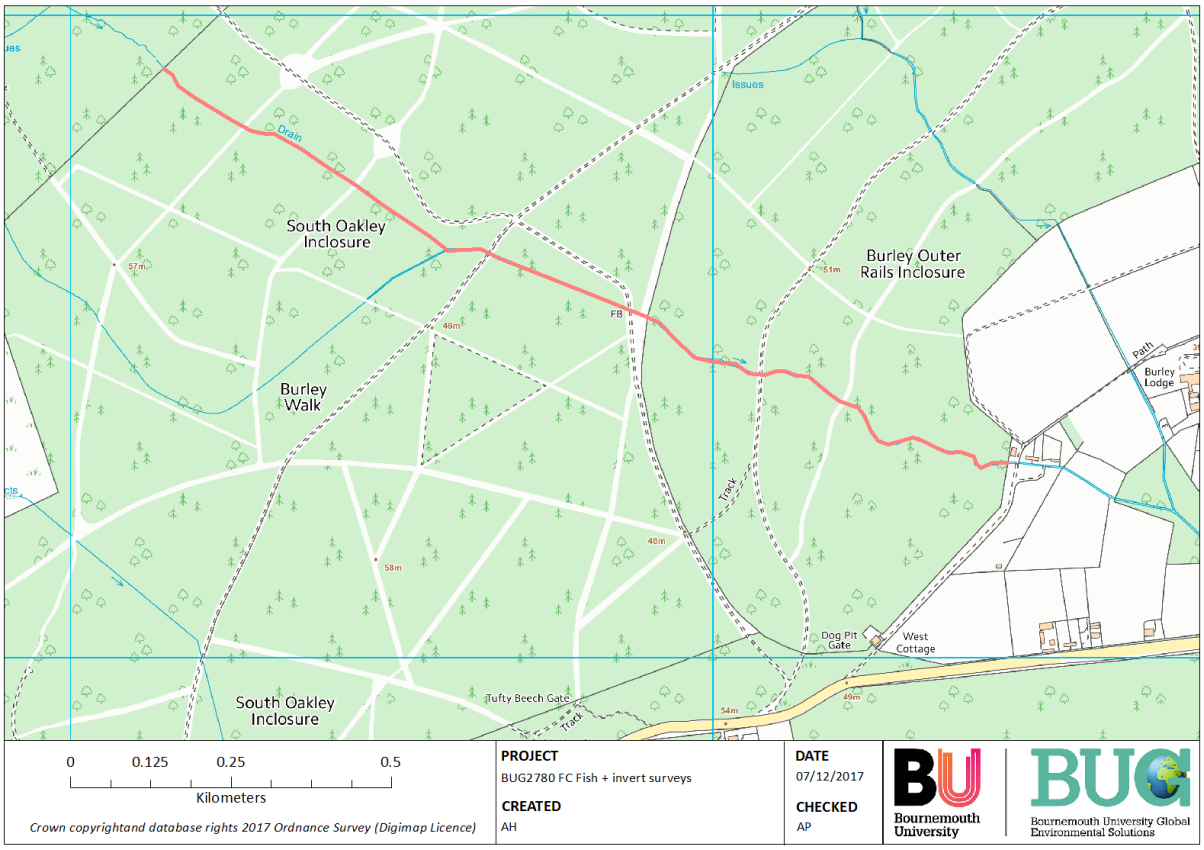

Figure 2.8. Extent of area of interest and redd count survey in South Oakley, shown in pink shading.

2.1.8 Wootton Phase 1

Wootton Phase 1 is located on the Avon Water (Figure 2.1). There are a total of five obstacles listed in the EA barrier database located downstream of the area of interest; however, the passability of these obstacles to fish is unknown.

The area of interest, shown in Figure 2.9, has a total length of 1.3 km. Two sites were surveyed within the area of interest at this location. The upstream and downstream extents of the 100 m electric fishing sites (blue dots) and invertebrate kick-sampling sites (green dots) are shown in Figure 2.9 and summarised in Table 2.7. A full description of the survey sites are provided within the results Sections 3.10 and 3.11.

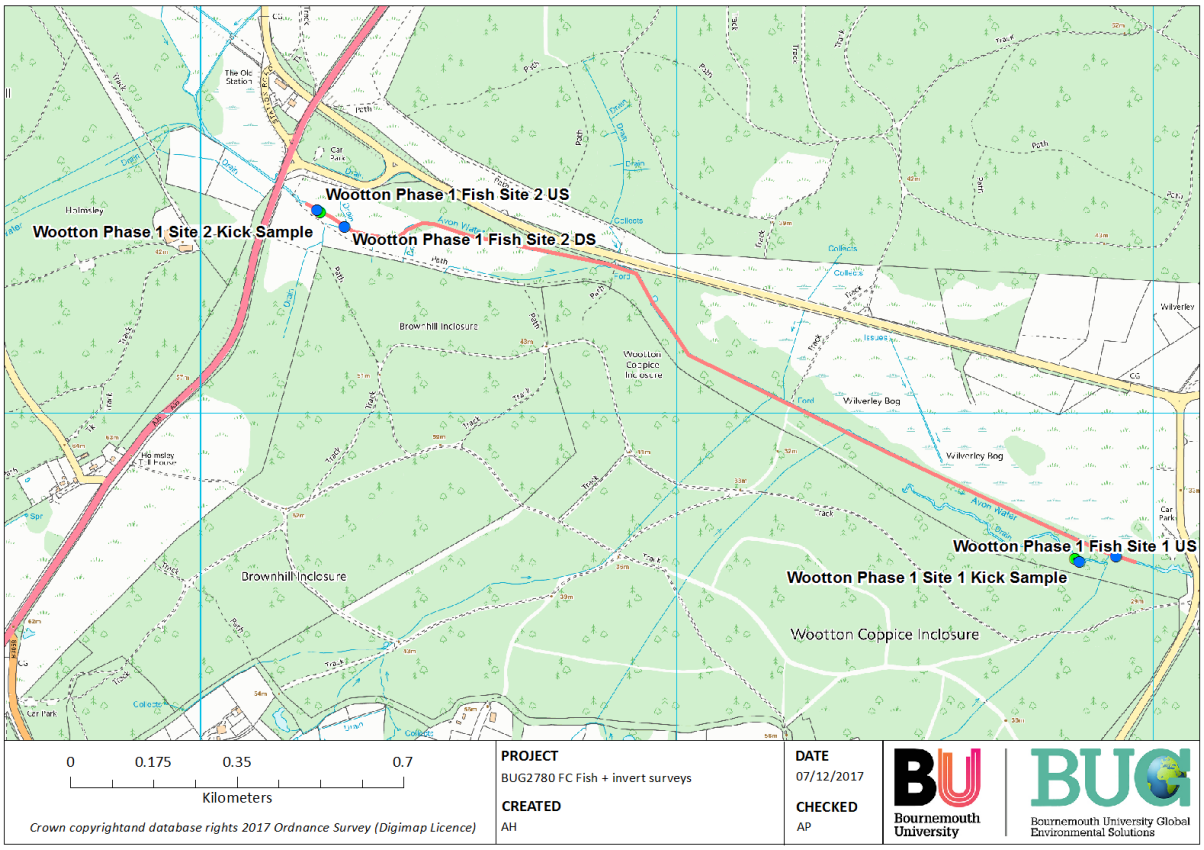

Figure 2.9. Upstream and downstream extent of survey areas at Wootton Phase 1. Extent of area of interest is shown in pink shading.

Table 2.7. Upstream and downstream limits of survey sites at Wootton Phase 1.

Site	Upstream extent of survey area	Downstream extent of survey area	Length of survey area (m)	Date of survey
Wootton Phase 1 Fish Site 1	SZ2484699689	SZ2492399700	100	21/09/2017
Wootton Phase 1 Fish Site 2	SU2324500427	SU2330200392	70	21/09/2017
Wootton Phase 1 Site 1 Kick Sample	SZ2483799696	N/A	N/A	21/09/2017
Wootton Phase 1 Site 2 Kick Sample	SU2325300422	N/A	N/A	21/09/2017

2.1.9 Wootton Phase 2

Wootton Phase 2 is located on the Avon Water (Figure 2.1). There are a total of five obstacles listed in the EA barrier database located downstream of the area of interest; however, the passability of these obstacles to fish is unknown.

The area of interest, shown in Figure 2.10, has a total length of 1.6 km. One site was surveyed within the area of interest at this location. The upstream and downstream extent of the 100 m electric fishing site (blue dots) and invertebrate kick-sampling site (green dot) are shown in Figure 2.10 and summarised in Table 2.8. A full description of the survey site is provided within the results Section 3.12.

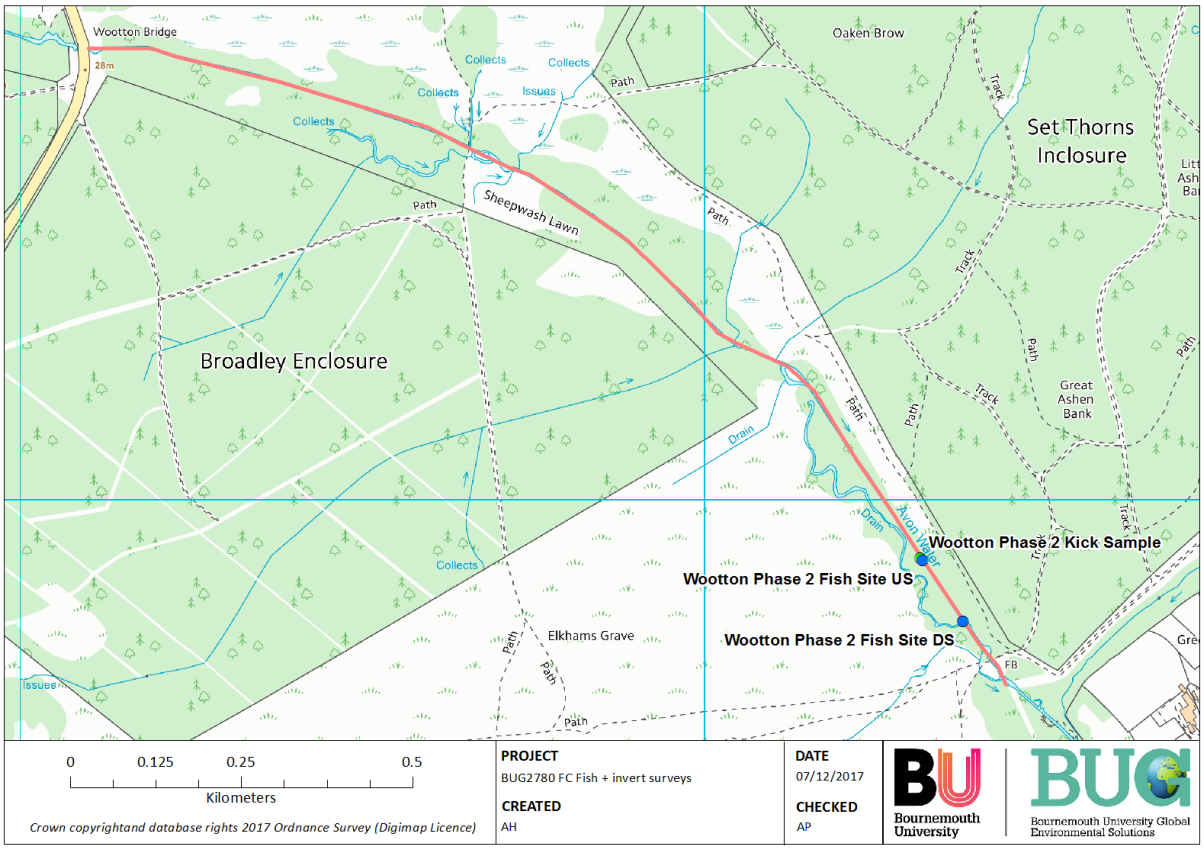

Figure 2.10. Upstream and downstream extent of survey area at Wootton Phase 2. Extent of area of interest is shown in pink shading.

Table 2.8. Upstream and downstream limits of survey sites at Wootton Phase 2.

Site	Upstream extent of survey area	Downstream extent of survey area	Length of survey area (m)	Date of survey
Wootton Phase 2 Fish Site	SZ2631898912	SZ2637898823	100	20/09/2017
Wootton Phase 2 Kick Sample Site	SZ2631698916	N/A	N/A	20/09/2017

2.2 Electric fishing

At each site, a fully-quantitative (triple run) electric fishing survey was conducted using backpack electric fishing kit. Stop-nets were positioned at both the upstream and downstream extent of the survey site to isolate a 100 m stretch. In combination with measurement of river habitat characteristics at 10 m intervals (e.g. width, depth and substrate), the total survey area was calculated for each site.

All fish captured were identified to species, a representative sub-sample of each species was measured, and all fish allowed to recover in aerated holding tanks prior to their release. Fish from each electric fishing run were processed separately to facilitate calculation of population densities using catch depletion models.

Fish capture, processing, data recording and analyses was completed in accordance with best practice guidance (e.g. Joint Nature Conservation Committee Common Standards Monitoring).

Where relevant, 0+ and 1++ brown trout densities were classified according to the National Fisheries Classification Scheme (NFCS), shown in Table 2.9 below.

Table 2.9. National Fisheries Classification Scheme for brown trout.

Classification	Density (No./100m^2)	
	Trout fry (0+)	Trout parr (1++)
A (Excellent)	>= 38	>= 21
B (Good)	17 – 37.9	12 – 20.9
C (Fair)	8 – 16.9	5 – 11.9
D (Fair / Poor)	3 – 7.9	2 – 4.9
E (Poor)	< 3	< 2
F (Fishless)	Absent	Absent

2.3 Invertebrate kick-sampling

2.3.1 Survey methodology

Macroinvertebrate samples were collected in accordance with the standard Environment Agency (EA) three-minute kick sampling procedure using a 1 mm mesh pond net (set out in '*Procedures For Collecting and Analysing Macroinvertebrate Samples*". BT001 3.0, Third Issue; 1991) and by the procedure for collecting and analysing macroinvertebrate samples for RIVPACS (Murray-Bligh *et al.* 1992).

At each sampling site, a basic suite of physico-chemical parameters (pH, temperature, conductivity, dissolved oxygen) and general habitat characteristics (water velocity category, width, depth and substratum composition) were recorded on standard RIVPACS/RICT '*Sample Area'* forms. These variables are useful both for describing the general sampling site characteristics, and also as predictor variables for running the RIVPACS (River Invertebrate and Prediction and Classification System) model (see Section 2.3.5).

All samples were accompanied by a GPS reading, and sampling site sketch map to facilitate subsequent return to the same location for re-survey work. In addition, the presence of aquatic macrophytes and other species observed incidentally during the macroinvertebrate sampling (e.g. fish) were also recorded.

All sampling equipment, chemical analysis probes and personal protective equipment had been thoroughly dried prior to visiting the site and all equipment was checked for foreign species, as recommended by the GB Non-Native Species Secretariat '*Check, Clean, Dry*' campaign (GB NNSS 2015). As an additional precaution, all equipment that might come into contact with the sampling sites was sprayed with '*Virkon® S*' (DuPont™) a powerful broad-spectrum virucidal, bactericidal and fungicidal disinfectant prior to visiting the sampling sites to prevent the transfer of crayfish plague or other pathogens.

Macroinvertebrate samples were fixed at the riverbank using 4% formaldehyde. The use of formaldehyde is considered superior to 70% Industrial Methylated Spirits due to its more rapid and thorough fixation of organic matter and the greatly enhanced shelf life of the samples and the invertebrate specimens they contain. Sample pots were clearly labelled both internally, using pencil and waterproof paper labels, and externally using a waterproof bullet marker. Samples were returned to the laboratory for processing.

2.3.2 Laboratory sample processing

Macroinvertebrate samples were sorted, identified and enumerated following the procedures set out in '*Procedures For Collecting and Analysing Macroinvertebrate Samples"*. BT001 3.0, Third Issue; 1991) and by the procedure for collecting and analysing macroinvertebrate samples for RIVPACS (Murray-Bligh *et al.* 1992). Samples were processed to species-level, specifically RIVPACS Taxonomic Level '*TL5*' (Davy-Bowker *et al.* 2010), and numerical abundances of all taxa were estimated and recorded on laboratory sample data sheets.

Examination of picked invertebrates was made using a binocular/compound microscope, as required. Appropriate taxonomic keys were used for identification, making reference to a reference collection, where necessary. All samples were reconstituted (put back into their original sample pots and re-preserved) and retained for subsequent quality assurance purposes. Where any specimens were retained for addition to a reference collection, this was clearly marked on the laboratory sample analysis sheets. All sample analyses were carried out by John Davy-Bowker.

2.3.3 Data entry and validation

Macroinvertebrate data from sample analysis laboratory datasheets were entered into a Microsoft® Access data entry database. Following data entry, sample validation reports (lists of entered species names and abundances) were printed out and manual data validation checks were performed to ensure that no errors arose due to data entry. Any data entry errors were corrected and the validation process was repeated until the data were error-free. Following validation, data were then exported for the calculation of biotic indices and RIVPACS/RICT Observed/Expected ratios.

2.3.4 Calculation of biotic indices

Data were imported into a Microsoft® Access database containing queries for the automatic calculation of a wide range of freshwater macroinvertebrate biotic indices at family and/or species levels.

Further information on the biotic indices is provided below (commonly used index abbreviations, the full name of each index, sources/references and typical types of environmental stress described by each index):

- **BMWP, NTAXA, ASPT**

  Name: Biological Monitoring Work Party

  Reference(s): Armitage *et al.* 1983; Hawkes 1997

  Stressor described: General degradation

- **WHPT, NTAXA, ASPT**

  Name: Whalley, Hawkes, Paisley, Trigg

  Reference(s): UKTAG 2014

  Stressor described: General degradation

- **AWIC(sp) Murphy**

  Name: Acid Water Indicator Community

  Reference(s): Murphy *et al.* 2013

  Stressor describe: Acidity/acidification stress

- **WFD AWIC(sp) McFarland**

  Name: *WFD Acid Water Indicator Community*

  Reference(s): McFarland 2010; UKTAG 2014

  Stressor described: Acidity/acidification stress

- **LIFE(sp)**

  Name: Lotic-invertebrate Index for Flow Evaluation

  Reference(s): *Extence et al. 1999*

  Stressor described: Flow stress

- **PSI(sp)**

  Name: Proportion of Sediment-sensitive Invertebrates

  Reference(s): *Extence et al. 2013*

  Stressor described: Sedimentation stress

- **SPEAR(sp)%**

  Name: Species At Risk

  Reference(s): Beketov *et al. 2008*

  Stressor described: Pesticide stress

- **CCI**

  Name: Community Conservation Index

  Reference(s): Chadd and Extence 2004

  Stressor described: Conservation value

2.3.5 RIVPACS/RICT Observed/Expected ratios

In addition to the calculation of observed biotic indices for the macroinvertebrate samples (described above) RIVPACS/RICT classification was undertaken using the RIVPACS IV predictive model (Davy-Bowker *et al*. 2008), run through the web-based RICT (River Invertebrate Classification Tool) software:

www.sepa.org.uk/environment/water/classification/river-invertebrates-classification-tool/

RIVPACS IV is the current RIVPACS model used by the Environment Agency and others to perform WFD quality assessments and is the industry standard for assessing the biological condition of running waters.

RIVPACS (River Invertebrate Prediction and Classification System) is a predictive model that uses environmental variables such as stream width and depth, distance from source, altitude, etc. to predict the reference (undisturbed) values of a range of biotic indices (Wright *et al.* 1997; Clarke *et al.* 2003). RIVPACS is based on a dataset of 685 GB reference sites that are grouped into similar 'end groups' whose biological communities are similar to each other. Predicted biotic indices for test samples were obtained by gathering the same environmental variables (environmental predictor variables) and running these through the model. Each test sample is assigned a probability of RIVPACS end group membership based on its environmental variables. The biotic index values of the reference sites in the various end groups then contribute to the predicted index values for the test sample. Rather than drawing the prediction solely from one end group of reference sites, the predictions of reference condition biotic indices are derived by the model as a weighted average depending upon probability of end group membership (Clarke *et al.* 2011).

The observed values of a wide range of commonly used biotic indices from the test samples were then compared to the RIVPACS expected values of the indices by the calculation of observed/expected ratios. For example, an observed biotic index value of 75 would be divided by an expected value of the same index, of say 85, to give an observed/expected (O/E) ratio of 0.882. An O/E ratio of greater than 1.0 indicates that a test sample has exceeded its predicted biotic index value (it is better than similar reference condition sites in the model); an O/E ratio of slightly below 1.0 (e.g. 0.882) indicates that a test sample is close to its predicted index value and is, therefore, only minimally impacted; an O/E ratio close to zero indicates that a test sample falls a long way short of its predicted biotic index value and it is, therefore, heavily stressed or degraded.

The O/E ratios of the Observed/Expected biotic indices were fitted into five bands, indicating the degree of disparity between the observed values and those expected by RIVPACS/RICT in the unstressed state. The five bands of O/E ratios used were as follows:

- > 1.3 Observed score better than expected
- 1.3 – 0.7 Observed score within expected range
- 0.7 – 0.5 Observed score slightly degraded compared to expected score
- 0.5 – 0.3 Observed score moderately degraded compared to expected score
- < 0.3 Observed score very degraded compared to expected score

It is important to note that the bands above are not WFD ecological status classes (which exist only for the WHPT biotic indices). They do, however, give a consistent framework to examine deviations of observed and expected biotic index values across all biotic indices used and, therefore, provide a framework to quantify the effects of a wider range of environmental stressors than WFD classification alone.

2.4 Redd counts

Redd count surveys were undertaken at all nine locations over four days during December 2017; Wednesday 13th December (Slufters and South Oakley), Friday 15th December (Latchmore Brook and Millersford Brook), Monday 18th December (Linford Brook, Wootton Phase 1 and Wootton Phase 2) and Tuesday 19th December (Dames Slough and Rhinefield).

The full extent of the area of interest at each location was walked by two experienced fisheries scientists and all evidence of sea trout (and resident brown trout) spawning was recorded. This included established redds, 'scrapes' and adult fish observations. Other salient features, such as debris dams and barriers to upstream migration were also recorded.

In the absence of positively identifying fish during redd construction; there is an unavoidable element of uncertainty with regard to classifying redds as either sea trout or resident brown trout. For the purposes of the current surveys, we have classified any redds greater than 0.4 m long x 0.4 m wide as belonging to sea trout.

A handheld GPS was used to record the location of points of interest, and field notes (redd size, fish size, behaviour, habitat, etc.) were recorded in a waterproof notepad. All data were transcribed and mapped in GIS and are presented in Section 5.

3. RESULTS – ELECTRIC FISHING SURVEYS

3.1 Dames Slough Site 1

3.1.1 Site description

Dames Slough Site 1 is located within an area of broadleaf / mixed woodland (see Section 2.1.1). Table 3.1 below summarises the key physical characteristics of the 100 m survey site, and Appendix 1 provides a photographic record of habitat variability. The mean wetted width was 2.16 m, with an overall surveyed area of 216.4 m^2.

A mixed substrate was present throughout, with some instream vegetation present in slower and shallower sections (Table 3.1). Fish habitat appeared typical of a coarse fish dominated system, and this was largely reflected in the fish survey data (Section 3.1.2).

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.2.

Table 3.1. Habitat data recorded during the electric fishing survey at Dames Slough Site 1.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	10	20	20	20	10	20		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent	10	20	10	20	20	20		
Instream vegetation: **10 %**		Silted? **Yes**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent		20	20	20	20	10	10	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	20	10		10	10			
Right bank %	20	10		10	10			
Total LB fish cover: **50 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **50 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / Simple / **Complex**				RB Bankface vegetation: Bare / Uniform / Simple / **Complex**				
LB Banktop vegetation: Bare / Uniform / Simple / **Complex**				RB Banktop vegetation: Bare / Uniform / Simple / **Complex**				
LB Overhanging Boughs (%): **5**			RB Overhanging Boughs (%): **5**			Canopy Cover (%): **70**		

Table 3.2. Physico-chemical parameters recorded during fish survey at Dames Slough Site 1.

Parameter	Value
Temperature (°C)	11.5
Dissolved Oxygen (%)	90.8
Dissolved Oxygen (mgl^{-1})	9.90
pH	6.28
Conductivity (μScm^{-1})	104.1

3.1.2 Electric fishing survey results

A total of 209 fish were captured at Dames Slough Site 1, comprising five species. Minnow was the most abundant species captured, followed by stoneloach and bullhead (Figure 3.1).

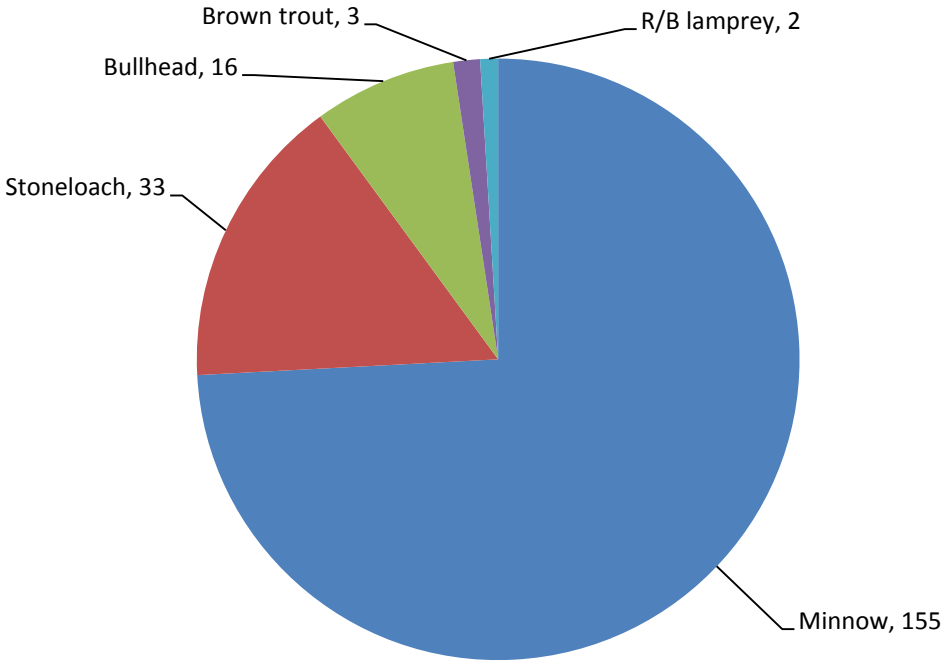

Figure 3.1. Species composition (total number captured) at Dames Slough Site 1.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.3. The National Fisheries Classification Scheme (NFCS) classifications for 0+ and 1++ brown trout are also shown.

Table 3.3. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Dames Slough Site 1. National Fisheries Classification Scheme (NFCS) grades are also provided for brown trout.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)	NFCS Classification
Minnow	155	156	0.78	153	159	72	N/A
Stoneloach	33	33	0.89	33	33	15	N/A
Bullhead	16	16	0.80	15	17	7	N/A
R/B lamprey	2	2	0.67	1	3	1	N/A
Brown trout (0+)	2	2	0.67	1	3	1	E (Poor)
Brown trout (1++)	1	1	0.50	0	2	<1	E (Poor)
TOTAL	**209**						

Length frequency charts for the most abundant fish species recorded are provided in Figure 3.2 to Figure 3.4below.

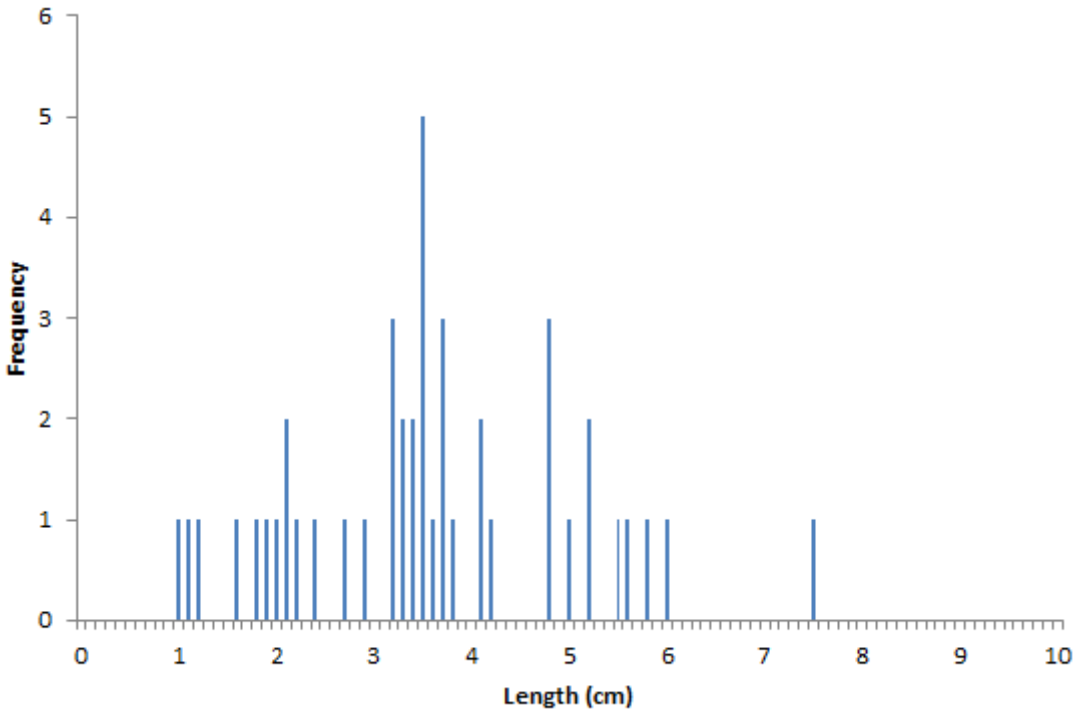

Figure 3.2. Length frequency of minnow captured at Dames Slough Site 1 (n=44).

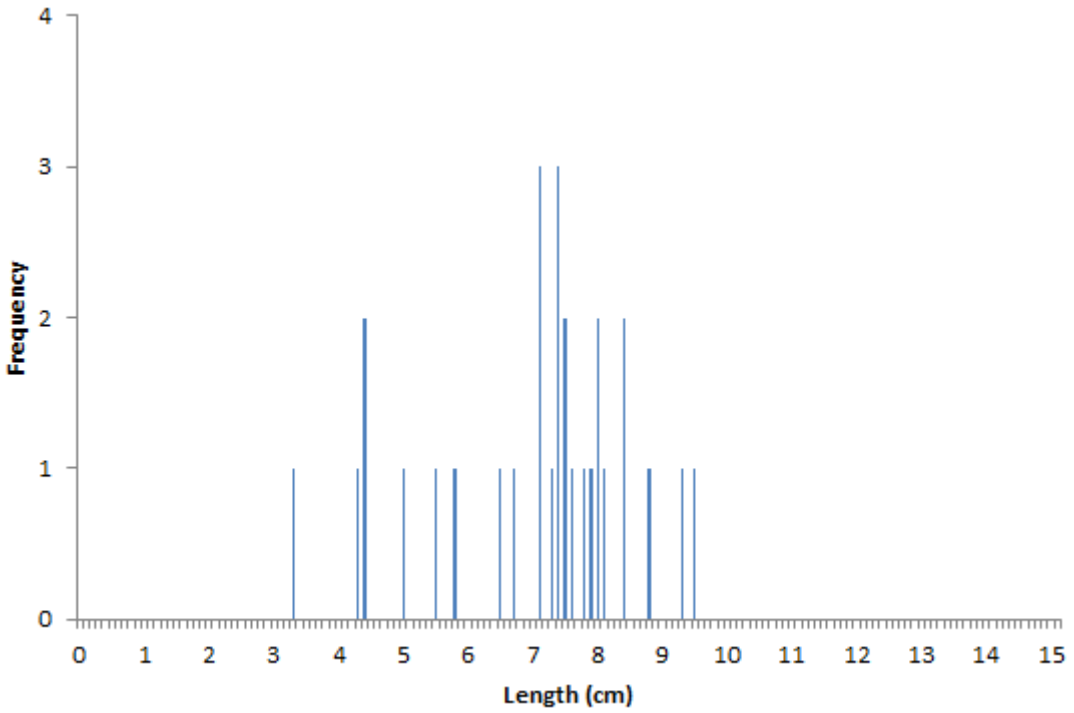

Figure 3.3. Length frequency of stoneloach captured at Dames Slough Site 1 (n=29).

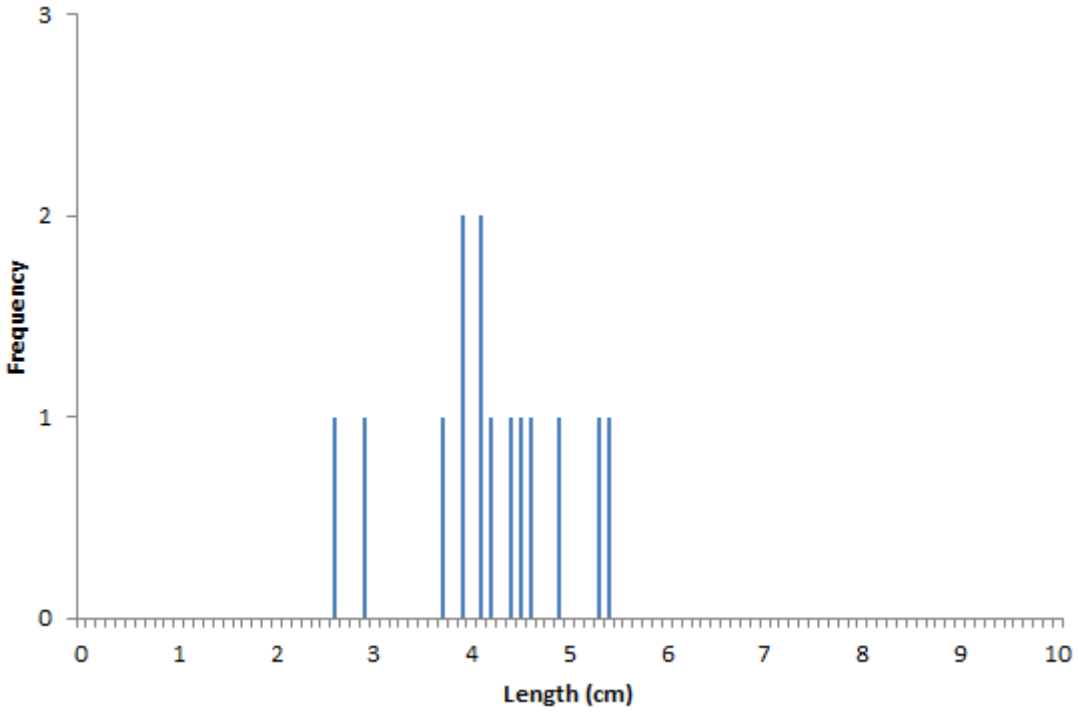

Figure 3.4. Length frequency of bullhead captured at Dames Slough Site 1 (n=14).

3.1.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Dames Slough Site 1 during the electric fishing survey.

Table 3.4. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Dames Slough Site 1.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	Y
Bullhead	Habitats Directive (Annex II)	Y	Y
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	N
Lamprey (Brook)	Habitats Directive (Annex II)	Y	Y
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.2 Dames Slough Site 2

3.2.1 Site description

Dames Slough Site 2 is located within an area of broadleaf / mixed woodland and moorland / heath (see Section 2.1.1). Table 3.5 below summarises the key physical characteristics of the 100 m survey site, and Appendix 2 provides a photographic record of habitat variability. The mean wetted width was 2.76 m, with an overall surveyed area of 276.4 m^2.

A mixed substrate was present throughout, with relatively abundant (30 %) instream vegetation present in slower and shallower sections (Table 3.5). Fish habitat appeared typical of a coarse fish dominated system, and this was largely reflected in the fish survey data (Section 3.2.2).

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.6.

Table 3.5. Habitat data recorded during the electric fishing survey at Dames Slough Site 2.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	10	20	20	20	20	10		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent	10	20		30	30	10		
Instream vegetation: **30 %**		Silted? **Yes**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent		10	10	10	30	20	20	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	10	5		20	5			
Right bank %	10	5		20	5			
Total LB fish cover: **40 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **40 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / Simple / **Complex**				RB Bankface vegetation: Bare / Uniform / Simple / **Complex**				
LB Banktop vegetation: Bare / Uniform / Simple / **Complex**				RB Banktop vegetation: Bare / Uniform / Simple / **Complex**				
LB Overhanging Boughs (%): **5**			RB Overhanging Boughs (%): **5**			Canopy Cover (%): **5**		

Table 3.6. Physico-chemical parameters recorded during fish survey at Dames Slough Site 2.

Parameter	Value
Temperature (°C)	13.4
Dissolved Oxygen (%)	101.4
Dissolved Oxygen (mgl^{-1})	10.57
pH	7.17
Conductivity (μScm^{-1})	109.7

3.2.2 Electric fishing survey results

A total of 119 fish were captured at Dames Slough Site 2, comprising five species. Stoneloach was the most abundant species captured, followed by bullhead and minnow (Figure 3.5).

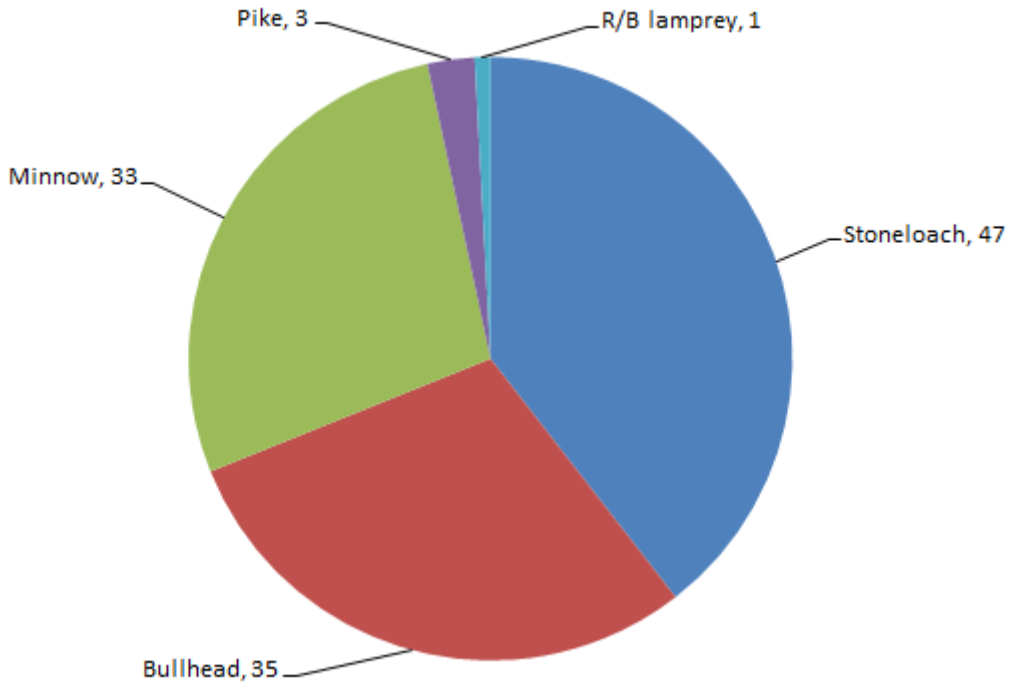

Figure 3.5. Species composition (total number captured) at Dames Slough Site 2.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.7.

Table 3.7. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Dames Slough Site 2.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)
Stoneloach	47	61	0.38	38	84	22
Bullhead	35	50	0.32	20	80	18
Minnow	33	37	0.51	29	45	13
Pike	3	3	0.75	2	4	1
R/B lamprey	1	1	1.00	1	1	<1
TOTAL	**119**					

Length frequency charts for the most abundant fish species recorded are provided in Figure 3.6 to Figure 3.8 below.

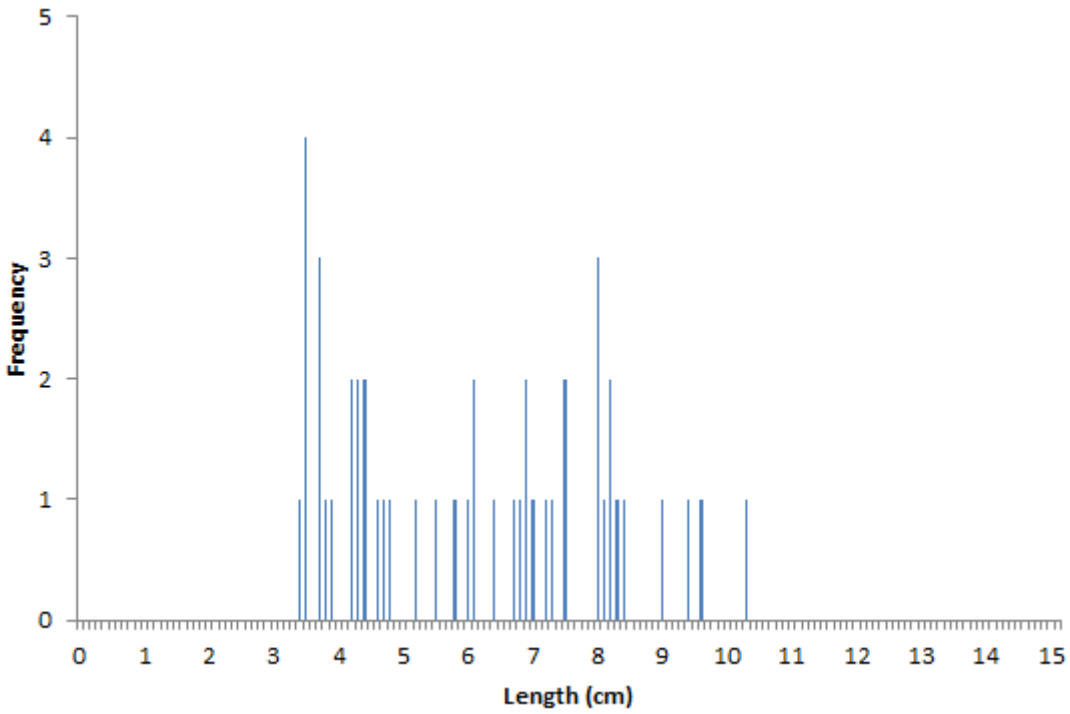

Figure 3.6. Length frequency of stoneloach captured at Dames Slough Site 2 (n=47).

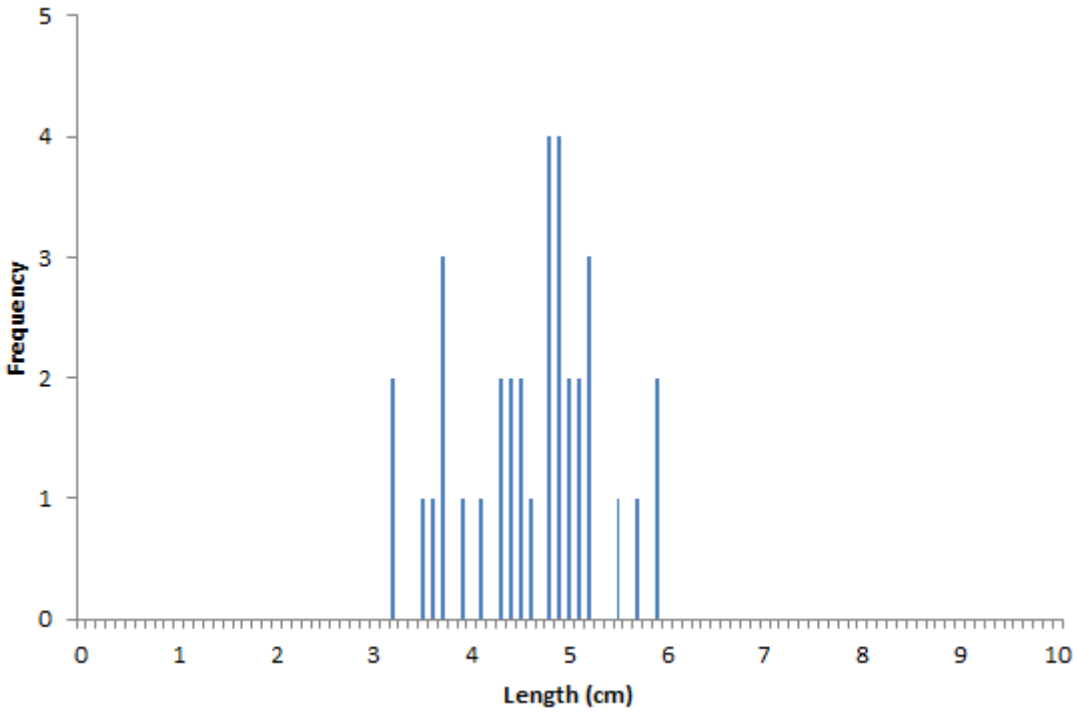

Figure 3.7. Length frequency of bullhead captured at Dames Slough Site 2 (n=35).

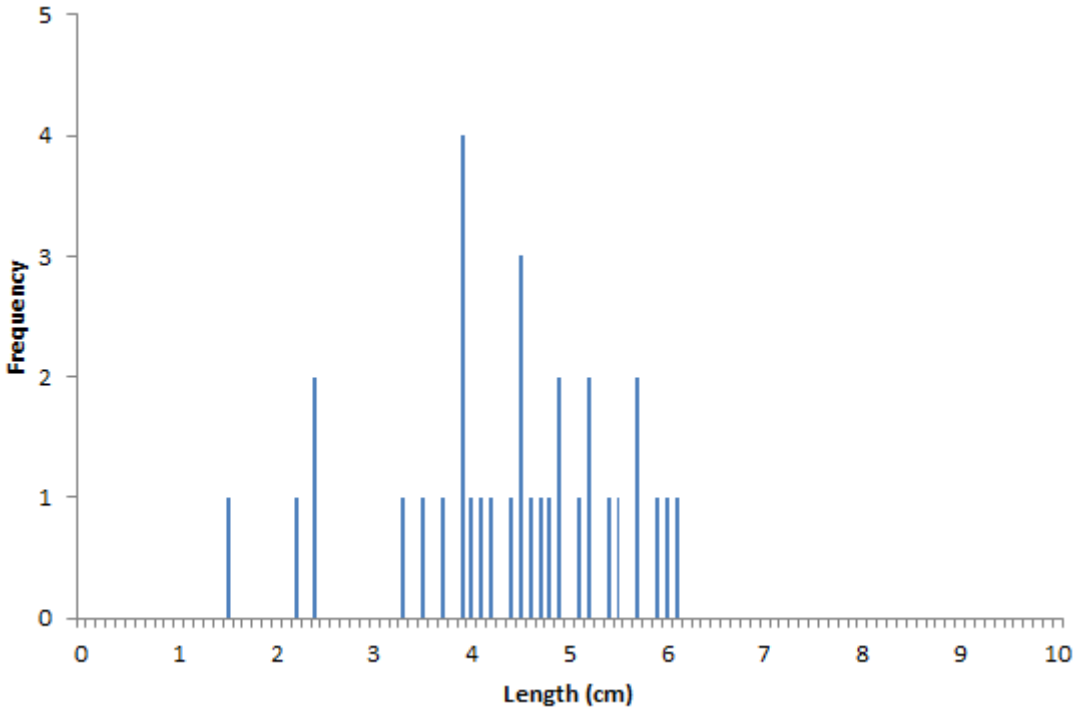

Figure 3.8. Length frequency of minnow captured at Dames Slough Site 2 (n=33).

3.2.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Dames Slough Site 1 during the electric fishing survey.

Table 3.8. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Dames Slough Site 2.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	N
Bullhead	Habitats Directive (Annex II)	Y	Y
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	N
Lamprey (Brook)	Habitats Directive (Annex II)	Y	Y
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.3 Latchmore Brook Site 1

3.3.1 Site description

Latchmore Brook Site 1 is located within an area of open moorland / heath (see Section 2.1.2). Table 3.9 below summarises the key physical characteristics of the 100 m survey site, and Appendix 3 provides a photographic record of habitat variability. The mean wetted width was 3.29 m, with an overall surveyed area of 329.1 m^2.

A mixed substrate was present throughout, with minimal instream vegetation present in slower and shallower sections (Table 3.9). Fish habitat appeared suitable for a variety of lithophilic species, including salmonids; although, marginal vegetation and shading was largely lacking.

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.10.

Table 3.9. Habitat data recorded during the electric fishing survey at Latchmore Brook Site 1.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	5	5	20	20	20	20		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent	10	10		20	40	20		
Instream vegetation: **5 %**		Silted? **No**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent		10	20	20	20	20	10	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	20	10			10			
Right bank %	20	10			10			
Total LB fish cover: **40 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **40 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / **Simple** / Complex				RB Bankface vegetation: Bare / Uniform / **Simple** / Complex				
LB Banktop vegetation: Bare / Uniform / **Simple** / Complex				RB Banktop vegetation: Bare / Uniform / **Simple** / Complex				
LB Overhanging Boughs (%): **5**			RB Overhanging Boughs (%): **5**			Canopy Cover (%): **0**		

Table 3.10. Physico-chemical parameters recorded during fish survey at Latchmore Brook Site 1.

Parameter	Value
Temperature (°C)	14.4
Dissolved Oxygen (%)	102.5
Dissolved Oxygen (mgl^{-1})	10.44
pH	7.2
Conductivity (μScm^{-1})	86.9

3.3.2 Electric fishing survey results

A total of 154 fish were captured at Latchmore Site 1, comprising five species. Minnow was the most abundant species captured, followed by chub and stoneloach (Figure 3.9).

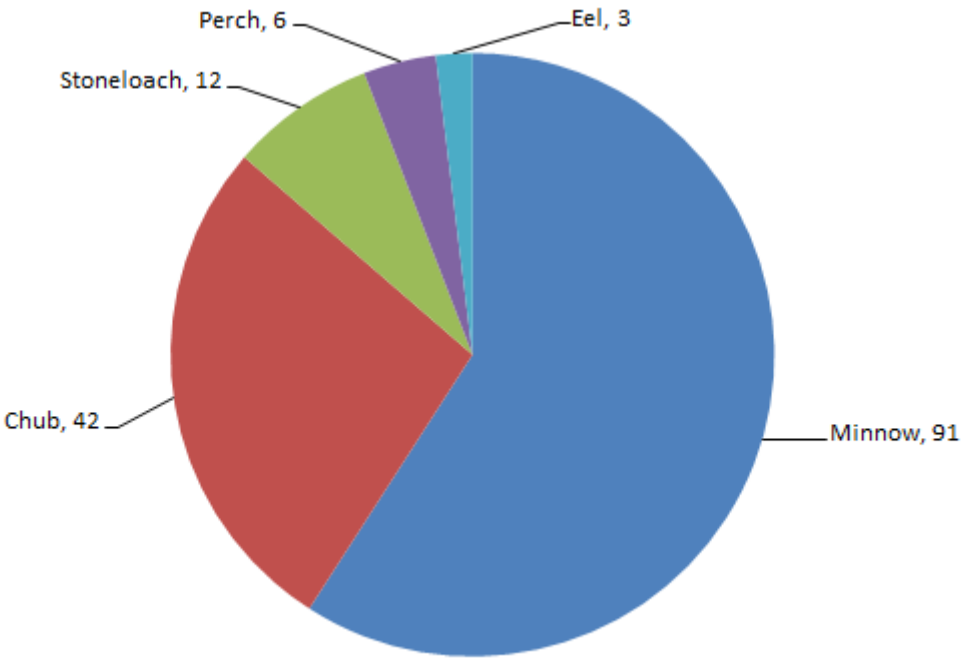

Figure 3.9. Species composition (total number captured) at Latchmore Brook Site 1.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.11.

Table 3.11. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Latchmore Brook Site 1.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)
Minnow	91	104	0.49	89	119	32
Chub	42	51	0.43	35	67	15
Stoneloach	12	14	0.43	6	22	4
Perch	6	6	0.55	3	9	2
Eel	3	3	0.50	1	5	1
TOTAL	**154**					

Length frequency charts for the most abundant fish species recorded are provided in Figure 3.10 to Figure 3.11 below. Where relevant, age cohorts (0+ and 1++) have been displayed on the charts; however, in the absence of age and growth analysis, it is emphasised that these are indicative only.

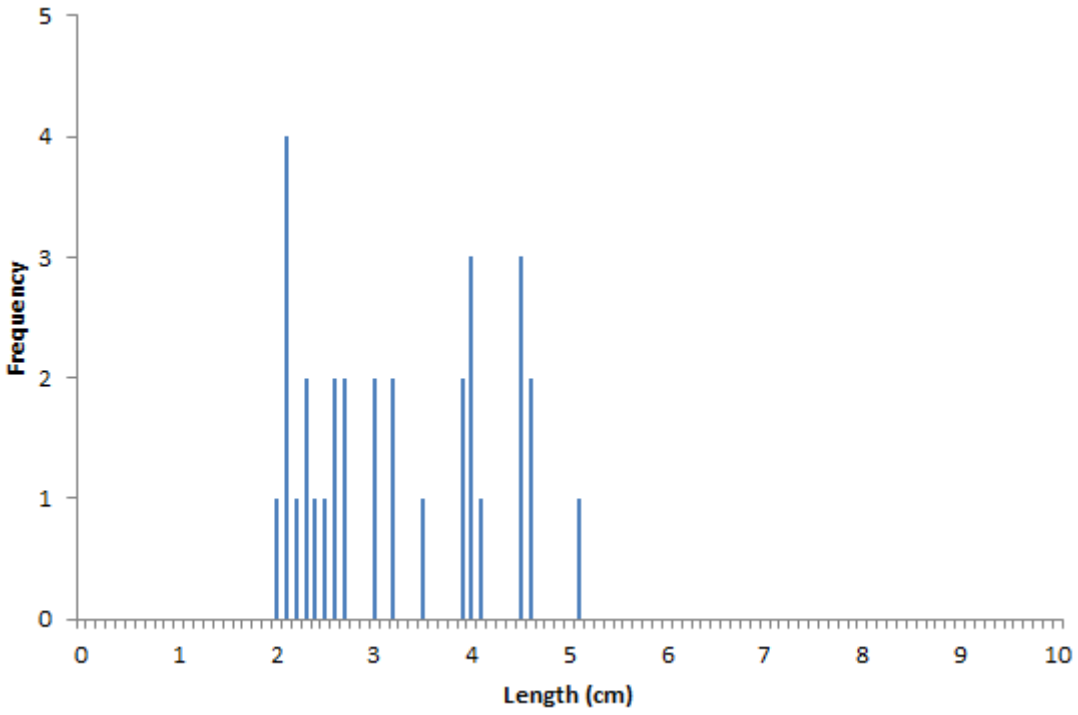

Figure 3.10. Length frequency of minnow captured at Latchmore Brook Site 1 (n=31).

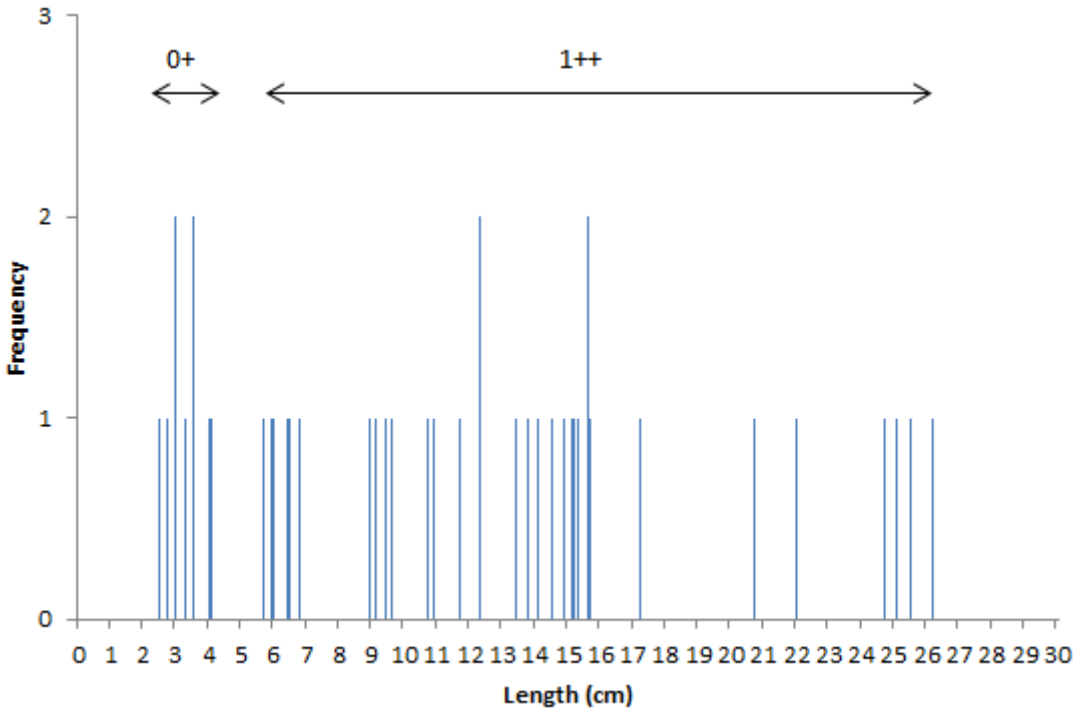

Figure 3.11. Length frequency of chub captured at Latchmore Brook Site 1 (n=42). In the absence of growth analysis, highlighted age cohorts are indicative only.

3.3.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Latchmore Brook Site 1 during the electric fishing survey.

Table 3.12. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Latchmore Brook Site 1.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	N
Bullhead	Habitats Directive (Annex II)	Y	N
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	Y
Lamprey (Brook)	Habitats Directive (Annex II)	Y	N
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.4 Latchmore Brook Site 2

3.4.1 Site description

Latchmore Brook Site 2 is located within an area of broadleaf / mixed woodland and moorland / heath (see Section 2.1.2). Table 3.13 below summarises the key physical characteristics of the 100 m survey site, and Appendix 4 provides a photographic record of habitat variability. The mean wetted width was 2.99 m, with an overall surveyed area of 299 m^2.

A mixed substrate was present throughout, with minimal instream vegetation present in slower and shallower sections (Table 3.13). Fish habitat appeared suitable for a variety of lithophilic species, including salmonids, with abundant instream and marginal cover.

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.14.

Table 3.13. Habitat data recorded during the electric fishing survey at Latchmore Brook Site 2.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	10	10	20	20	20	20		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent	5	5		10	50	30		
Instream vegetation: **5 %**		Silted? **No**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent		10	10	10	10	40	20	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	20	30			10			
Right bank %	20	30			10			
Total LB fish cover: **60 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **60 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / Simple / **Complex**				RB Bankface vegetation: Bare / Uniform / Simple / **Complex**				
LB Banktop vegetation: Bare / Uniform / Simple / **Complex**				RB Banktop vegetation: Bare / Uniform / Simple / **Complex**				
LB Overhanging Boughs (%): 2**0**			RB Overhanging Boughs (%): 2**0**			Canopy Cover (%): 9**0**		

Table 3.14. Physico-chemical parameters recorded during fish survey at Latchmore Brook Site 2.

Parameter	Value
Temperature (°C)	12.9
Dissolved Oxygen (%)	98.4
Dissolved Oxygen (mgl^{-1})	10.39
pH	7.61
Conductivity (μScm^{-1})	80.1

3.4.2 Electric fishing survey results

A total of 194 fish were captured at Latchmore Brook Site 2, comprising five species. Minnow was the most abundant species captured, followed by chub and stoneloach (Figure 3.12).

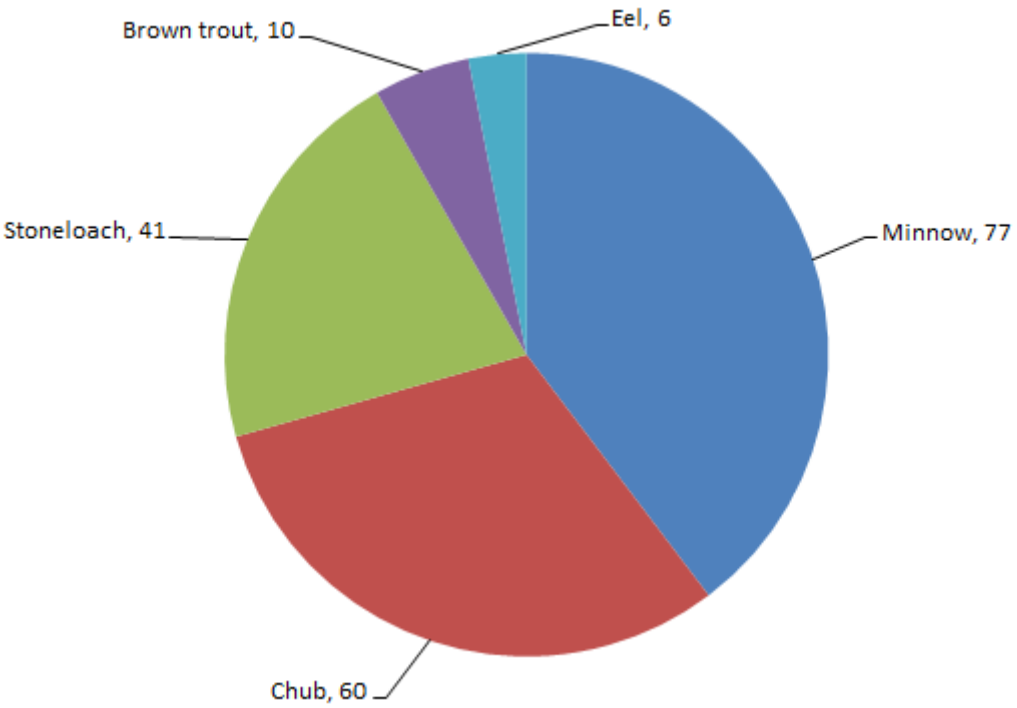

Figure 3.12. Species composition (total number captured) at Latchmore Brook Site 2.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.15. The National Fisheries Classification Scheme (NFCS) classifications for 0+ and 1++ brown trout are also shown.

Table 3.15. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Latchmore Brook Site 2. National Fisheries Classification Scheme (NFCS) grades are also provided for brown trout.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)	NFCS Classification
Minnow	77	84	0.55	74	94	28	N/A
Chub	60	61	0.70	58	64	20	N/A
Stoneloach	41	50	0.42	34	66	17	N/A
Brown trout (1++)	9	9	0.69	8	10	3	D (Fair / Poor)
Eel	6	6	0.75	5	7	2	N/A
Brown trout (0+)	1	1	0.50	0	2	<1	E (Poor)
TOTAL	**194**						

Length frequency charts for the most abundant fish species recorded are provided in Figure 3.13 to Figure 3.16 below. Where relevant, age cohorts (0+ and 1++) have been displayed on the charts; however, in the absence of age and growth analysis, it is emphasised that these are indicative only.

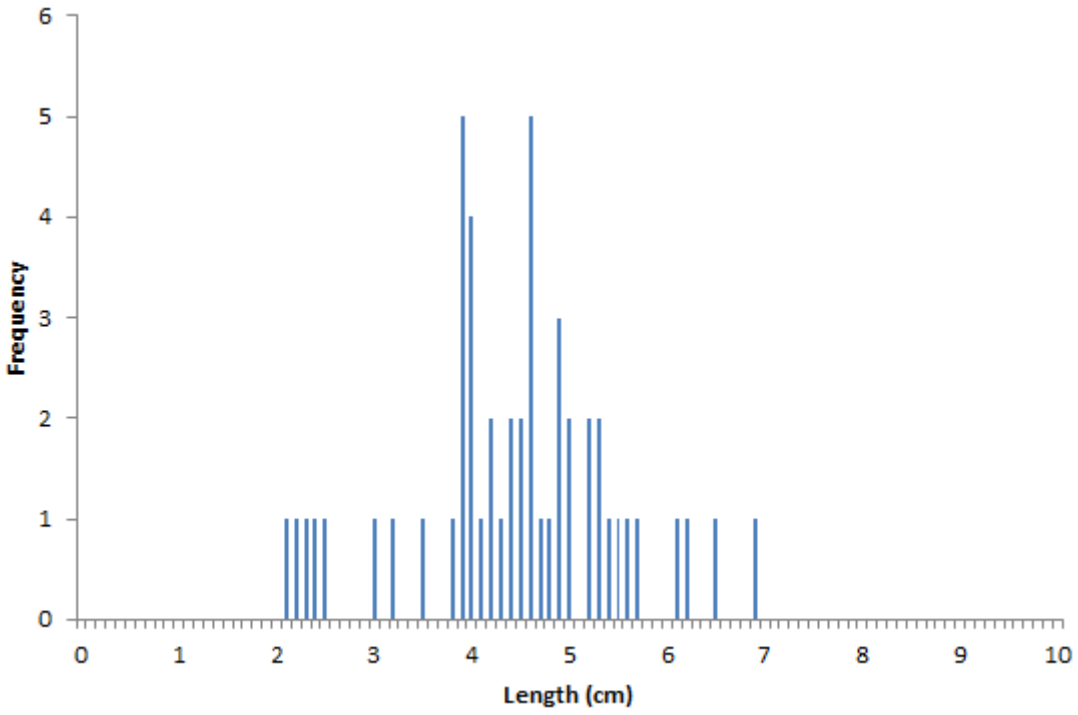

Figure 3.13. Length frequency of minnow captured at Latchmore Brook Site 2 (n=50).

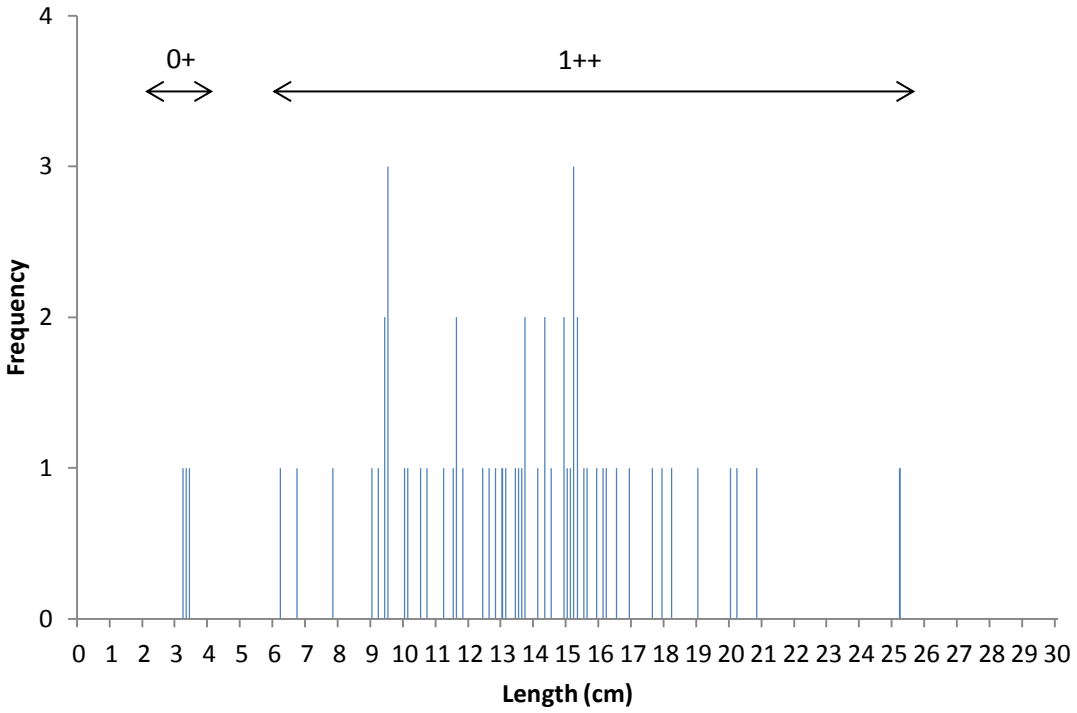

Figure 3.14. Length frequency of chub captured at Latchmore Brook Site 2 (n=60). In the absence of growth analysis, highlighted age cohorts are indicative only.

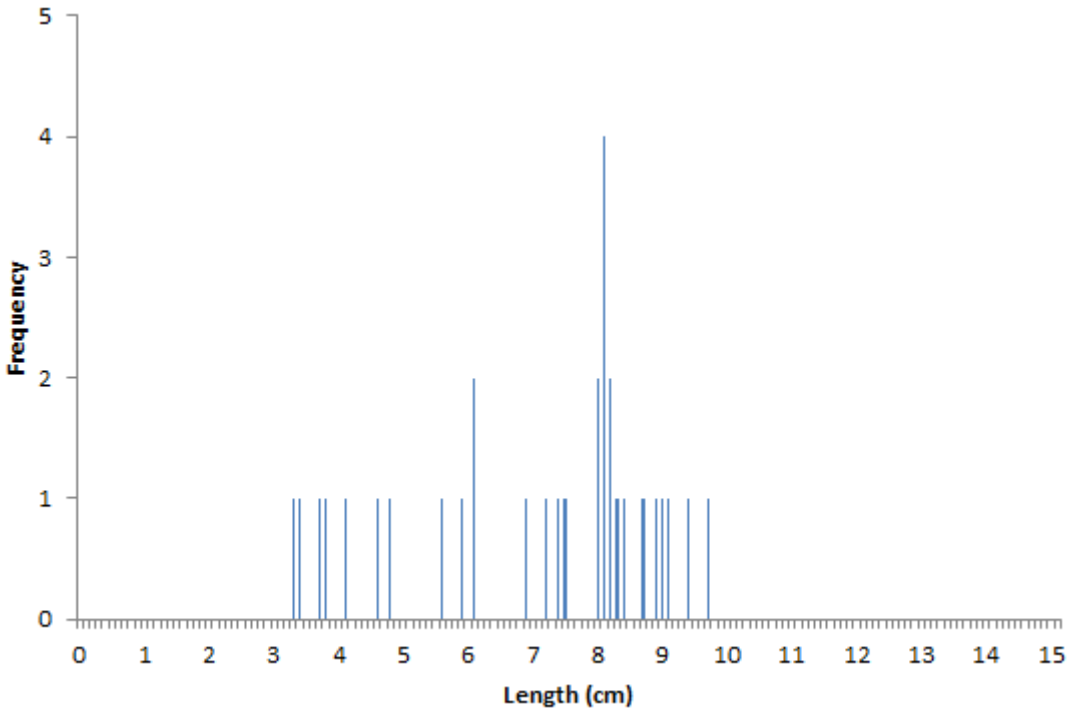

Figure 3.15. Length frequency of stoneloach captured at Latchmore Brook Site 2 (n=31).

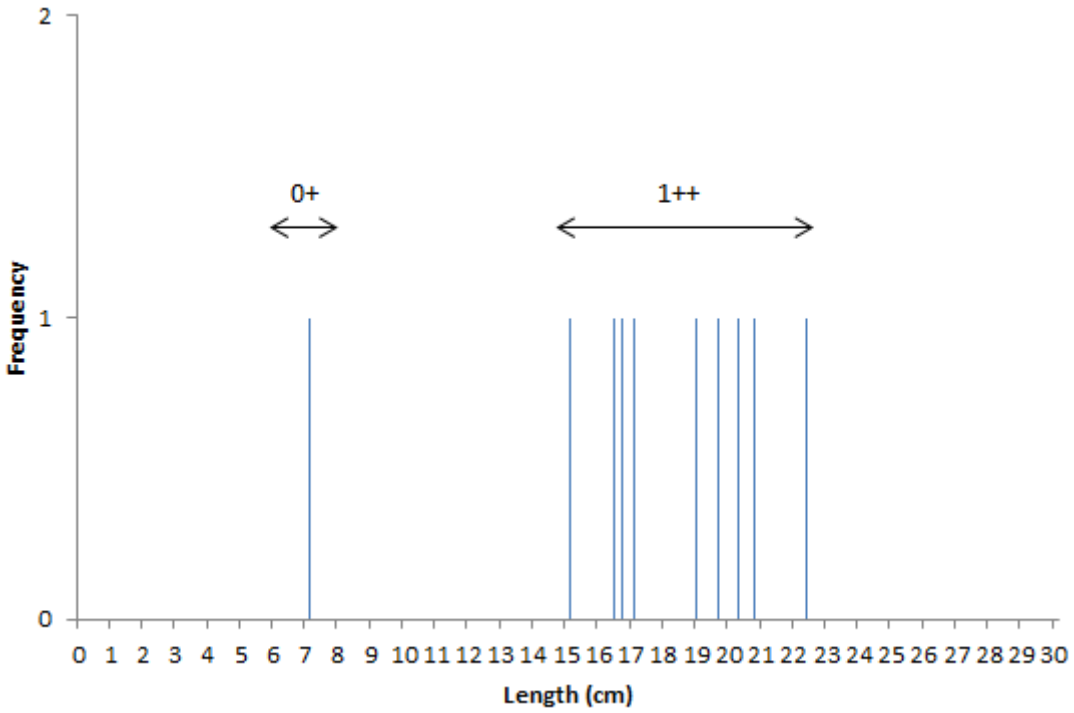

Figure 3.16. Length frequency of brown trout captured at Latchmore Brook Site 2 (n=10). In the absence of growth analysis, highlighted age cohorts are indicative only.

3.4.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Dames Slough Site 1 during the electric fishing survey.

Table 3.16. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Latchmore Brook Site 2.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	Y
Bullhead	Habitats Directive (Annex II)	Y	N
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	Y
Lamprey (Brook)	Habitats Directive (Annex II)	Y	N
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.5 Millersford Brook Site 1

3.5.1 Site description

Millersford Brook Site 1 is located within an area of broadleaf / mixed woodland (see Section 2.1.4); however, the area has been subject to intensive forestry activities and the drained channel is heavily incised. Table 3.17 below summarises the key physical characteristics of the 100 m survey site, and Appendix 5 provides a photographic record of habitat variability. The mean wetted width was 1.45 m, with an overall surveyed area of 144.5 m^2.

The stream was characterised by very shallow, uniform and channelised habitat, with few holding areas for fish and limited bankside cover. Furthermore, pH and conductivity during the time of the survey were very low. The relatively poor habitat quality was reflected in a lack of any fish captured during the survey.

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.18.

Table 3.17. Habitat data recorded during the electric fishing survey at Millersford Brook Site 1.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	30	30	20	10	5	5		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent		10		20	50	20		
Instream vegetation: **0 %**		Silted? **Yes**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent		10	10	10	10	30	30	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	5			5				
Right bank %	5			5				
Total LB fish cover: **10 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **10 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / Simple / **Complex**				RB Bankface vegetation: Bare / Uniform / Simple / **Complex**				
LB Banktop vegetation: Bare / Uniform / Simple / **Complex**				RB Banktop vegetation: Bare / Uniform / Simple / **Complex**				
LB Overhanging Boughs (%): **5**			RB Overhanging Boughs (%): **5**			Canopy Cover (%): **5**		

Table 3.18. Physico-chemical parameters recorded during fish survey at Millersford Brook Site 1.

Parameter	Value
Temperature (°C)	13.0
Dissolved Oxygen (%)	101.2
Dissolved Oxygen (mgl^{-1})	10.69
pH	4.69
Conductivity (μScm^{-1})	59.6

3.5.2 Electric fishing survey results

No fish captured.

3.6 Millersford Brook Site 2

3.6.1 Site description

Millersford Brook Site 2 is located within an area of broadleaf / mixed woodland and moorland / heath (see Section 2.1.4). Table 3.19 below summarises the key physical characteristics of the 100 m survey site, and Appendix 6 provides a photographic record of habitat variability. The mean wetted width was 2.49 m, with an overall surveyed area of 249.1 m^2.

Substrate mainly comprised mixed gravel, pebble and cobble, with abundant bankside cover and marginal vegetation Although the channel was relatively incised in areas; fish habitat appeared typical of salmonid habitat, and this was reflected in the fish survey data (Section 3.6.2).

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.20.

Table 3.19. Habitat data recorded during the electric fishing survey at Millersford Brook Site 2.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	10	20	20	20	20	10		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent	5	10	5	10	40	30		
Instream vegetation: **0 %**		Silted? **Yes**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent	10	10	10	10	10	20	30	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	50	10			10			
Right bank %	50	10			10			
Total LB fish cover: **70 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **70 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / Simple / **Complex**				RB Bankface vegetation: Bare / Uniform / Simple / **Complex**				
LB Banktop vegetation: Bare / Uniform / Simple / **Complex**				RB Banktop vegetation: Bare / Uniform / Simple / **Complex**				
LB Overhanging Boughs (%): **50**			RB Overhanging Boughs (%): **50**			Canopy Cover (%): **100**		

Table 3.20. Physico-chemical parameters recorded during fish survey at Millersford Brook Site 2.

Parameter	Value
Temperature (°C)	13.0
Dissolved Oxygen (%)	89.5
Dissolved Oxygen (mgl^{-1})	9.43
pH	7.26
Conductivity (μScm^{-1})	127.6

3.6.2 Electric fishing survey results

A total of 43 fish were captured at Millersford Brook Site 2, comprising two species; brown trout and eel (Figure 3.17).

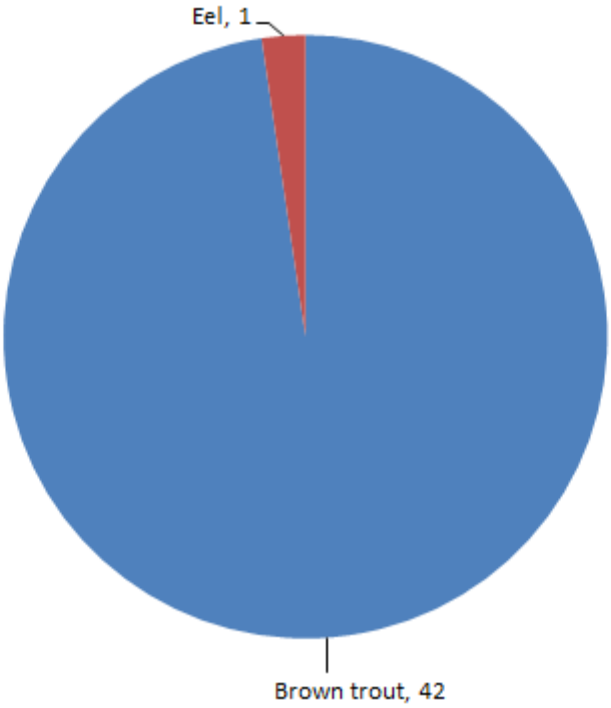

Figure 3.17. Species composition (total number captured) at Milersford Brook Site 2.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.21. The National Fisheries Classification Scheme (NFCS) classifications for 0+ and 1++ brown trout are also shown.

Table 3.21. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Millersford Brook Site 2. National Fisheries Classification Scheme (NFCS) grades are also provided for brown trout.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)	NFCS Classification
Brown trout (1++)	30	32	0.58	27	37	13	B (Good)
Brown trout (0+)	12	12	0.92	12	12	5	D (Fair / Poor)
Eel	1	1	1	1	1	<1	N/A
TOTAL	**43**						

A length frequency chart for brown trout is provided in Figure 3.18 below. Age cohorts (0+ and 1++) have been displayed on the chart; however, in the absence of age and growth analysis, it is emphasised that these are indicative only.

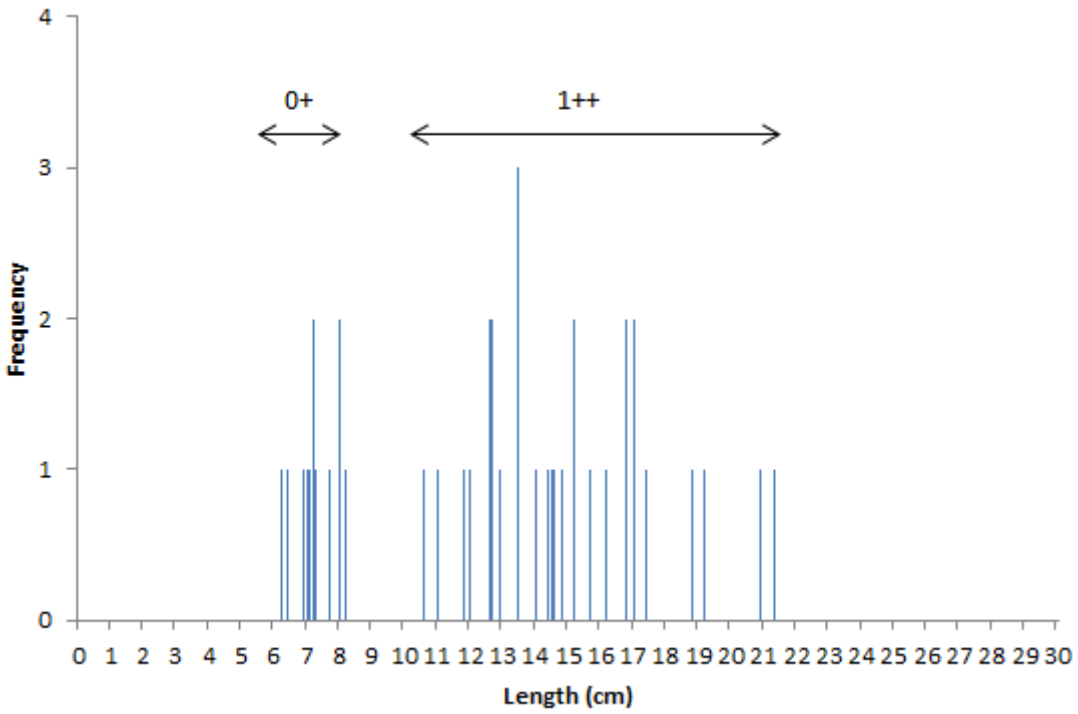

Figure 3.18. Length frequency of brown trout captured at Millersford Brook Site 2 (n=42). In the absence of growth analysis, highlighted age cohorts are indicative only.

3.6.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Millersford Brook Site 2 during the electric fishing survey.

Table 3.22. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Millersford Brook Site 2.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	Y
Bullhead	Habitats Directive (Annex II)	Y	N
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	Y
Lamprey (Brook)	Habitats Directive (Annex II)	Y	N
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.7 Millersford Brook Site 3

3.7.1 Site description

Millersford Brook Site 3 is located within an area of broadleaf / mixed woodland and moorland / heath (see Section 2.1.4). Table 3.23 below summarises the key physical characteristics of the 100 m survey site, and Appendix 7 provides a photographic record of habitat variability. The mean wetted width was 1.85 m, with an overall surveyed area of 184.5 m^2.

Substrate mainly comprised mixed gravel, pebble and cobble, with abundant bankside cover and marginal vegetation. Although the channel was relatively incised in areas; fish habitat appeared typical of salmonid habitat, and this was reflected in the fish survey data (Section 3.7.2).

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.24.

Table 3.23. Habitat data recorded during the electric fishing survey at Millersford Brook Site 3.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	10	10	20	20	20	20		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent	10	10		20	40	20		
Instream vegetation: **0 %**		Silted? **Yes**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent		20	10		20	20	30	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	30	10			10	10		
Right bank %	30	10			10	10		
Total LB fish cover: **60 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **60 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / Simple / **Complex**				RB Bankface vegetation: Bare / Uniform / Simple / **Complex**				
LB Banktop vegetation: Bare / Uniform / Simple / **Complex**				RB Banktop vegetation: Bare / Uniform / Simple / **Complex**				
LB Overhanging Boughs (%): **50**			RB Overhanging Boughs (%): **50**			Canopy Cover (%): **90**		

Table 3.24. Physico-chemical parameters recorded during fish survey at Millersford Brook Site 3.

Parameter	Value
Temperature (°C)	11.6
Dissolved Oxygen (%)	93.8
Dissolved Oxygen (mgl^{-1})	10.18
pH	7.8
Conductivity (μScm^{-1})	172.9

3.7.2 Electric fishing survey results

A total of 27 fish were captured at Millersford Brook Site 3, comprising a single species; brown trout was the only species captured.

The total number captured, length range (cm) and catch depletion density estimate for brown trout is shown in Table 3.25. The National Fisheries Classification Scheme (NFCS) classifications for 0+ and 1++ brown trout are also shown.

Table 3.25. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Millersford Brook Site 3. National Fisheries Classification Scheme (NFCS) grades are also provided for brown trout.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)	NFCS Classification
Brown trout (0+)	14	14	0.82	13	15	8	C (Fair)
Brown trout (1++)	13	13	0.68	11	15	7	C (Fair)
TOTAL	**27**						

A length frequency chart for brown trout is provided in Figure 3.19 below. Age cohorts (0+ and 1++) have been displayed on the chart; however, in the absence of age and growth analysis, it is emphasised that these are indicative only.

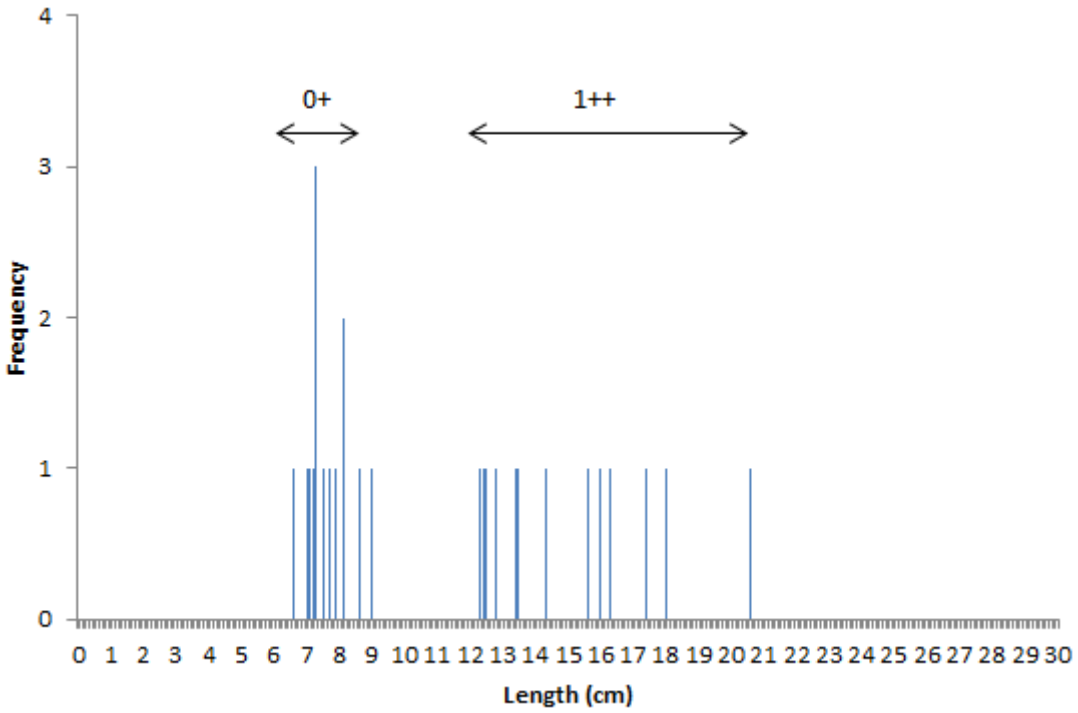

Figure 3.19. Length frequency of brown trout captured at Millersford Brook Site 3 (n=7). In the absence of growth analysis, highlighted age cohorts are indicative only.

3.7.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Dames Slough Site 1 during the electric fishing survey.

Table 3.26. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Millersford Brook Site 3.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	Y
Bullhead	Habitats Directive (Annex II)	Y	N
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	N
Lamprey (Brook)	Habitats Directive (Annex II)	Y	N
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.8 Rhinefield

3.8.1 Site description

Rhinefield is located within an area of broadleaf / mixed woodland (see Section 2.1.5). Table 3.27 below summarises the key physical characteristics of the 100 m survey site, and Appendix 8 provides a photographic record of habitat variability. The mean wetted width was 3.45 m, with an overall surveyed area of 345.5 m^2.

A mixed substrate was present throughout, with relatively abundant (30 %) instream vegetation present in slower and shallower sections (Table 3.27).

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.28.

Table 3.27. Habitat data recorded during the electric fishing survey at Rhinefield.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	20	30	20	20	5	5		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent		10	10	40	30	10		
Instream vegetation: **30 %**		Silted? **Yes**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent	10		30	10	20	20	10	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	30	5		5	10			
Right bank %	30	5		5	10			
Total LB fish cover: **50 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **50 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / Simple / **Complex**				RB Bankface vegetation: Bare / Uniform / Simple / **Complex**				
LB Banktop vegetation: Bare / Uniform / Simple / **Complex**				RB Banktop vegetation: Bare / Uniform / Simple / **Complex**				
LB Overhanging Boughs (%): **10**			RB Overhanging Boughs (%): **10**			Canopy Cover (%): **80**		

Table 3.28. Physico-chemical parameters recorded during fish survey at Rhinefield.

Parameter	Value
Temperature (°C)	12.0
Dissolved Oxygen (%)	92.0
Dissolved Oxygen (mgl^{-1})	9.92
pH	7.13
Conductivity (μScm^{-1})	105.6

3.8.2 Electric fishing survey results

A total of 105 fish were captured at Rhinefield, comprising six species. Stoneloach was the most abundant species captured, followed by bullhead and minnow (Figure 3.20).

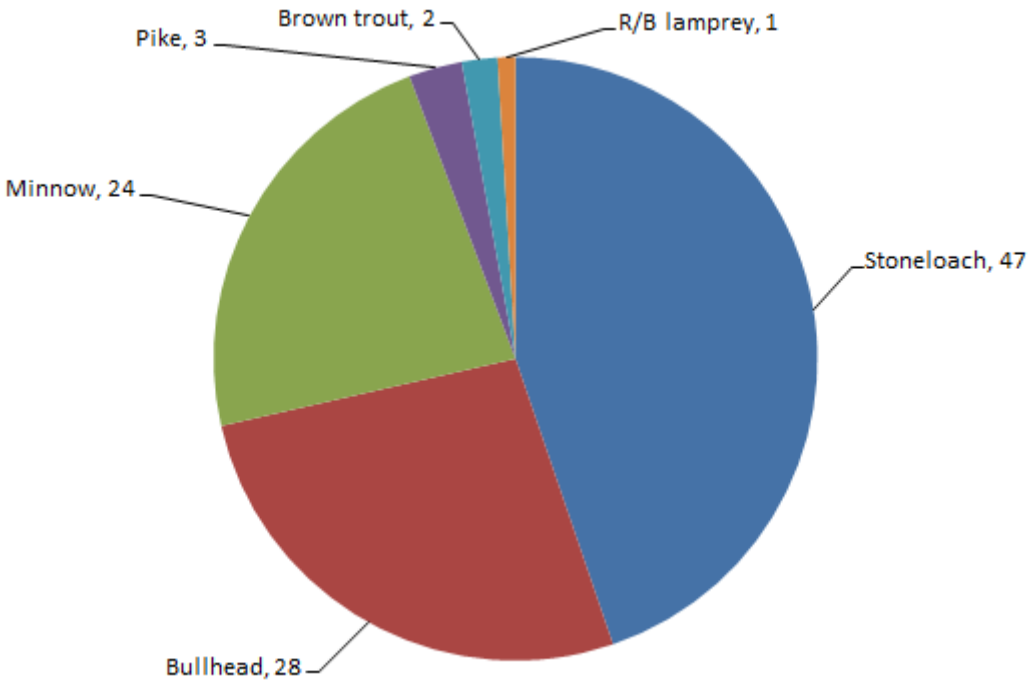

Figure 3.20. Species composition (total number captured) at Rhinefield.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.29. The National Fisheries Classification Scheme (NFCS) classifications for 0+ and 1++ brown trout are also shown.

Table 3.29. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Rhinefield. National Fisheries Classification Scheme (NFCS) grades are also provided for brown trout.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)	NFCS Classification
Stoneloach	47	49	0.63	44	54	14	N/A
Bullhead	28	31	0.51	23	39	9	N/A
Minnow	24	26	0.55	20	32	8	N/A
Pike	3	3	0.75	2	4	1	N/A
R/B lamprey	1	1	0.33	-3	5	<1	N/A
Brown trout (0+)	1	1	1.00	1	1	<1	E (Poor)
Brown trout (1++)	1	1	1.00	1	1	<1	E (Poor)
TOTAL	**105**						

Length frequency charts for the most abundant fish species recorded are provided in Figure 3.21 to Figure 3.23 below. Where relevant, age cohorts (0+ and 1++) have been displayed on the charts; however, in the absence of age and growth analysis, it is emphasised that these are indicative only.

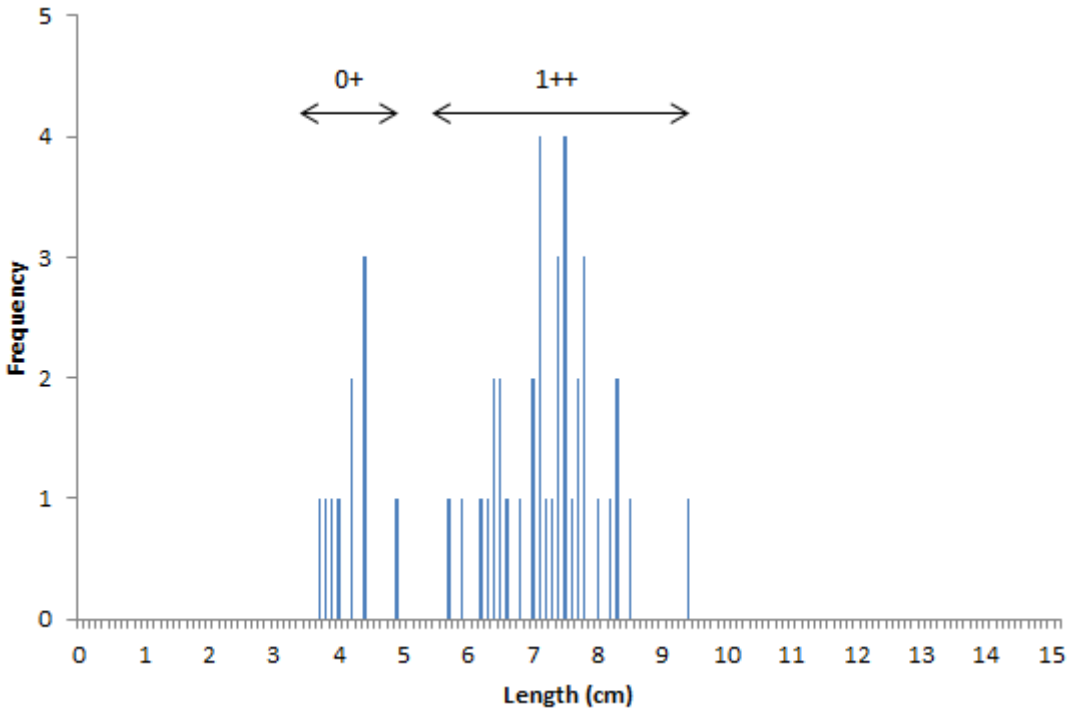

Figure 3.21. Length frequency of stoneloach captured at Rhinefield (n=47). In the absence of growth analysis, highlighted age cohorts are indicative only.

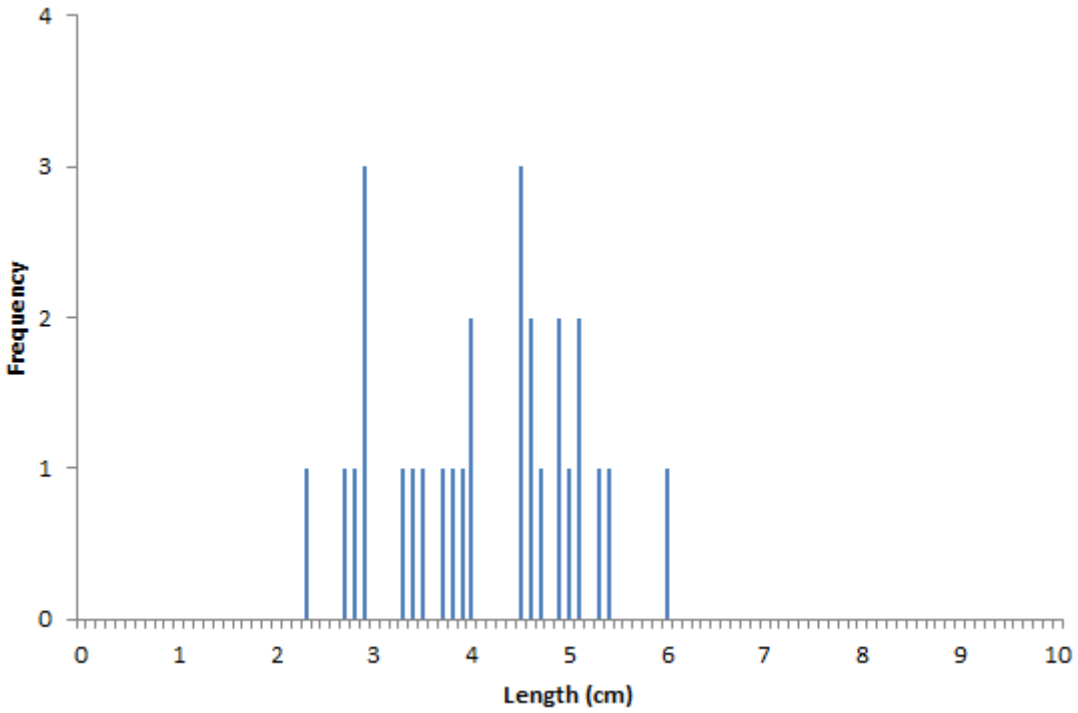

Figure 3.22. Length frequency of bullhead captured at Rhinefield (n=28).

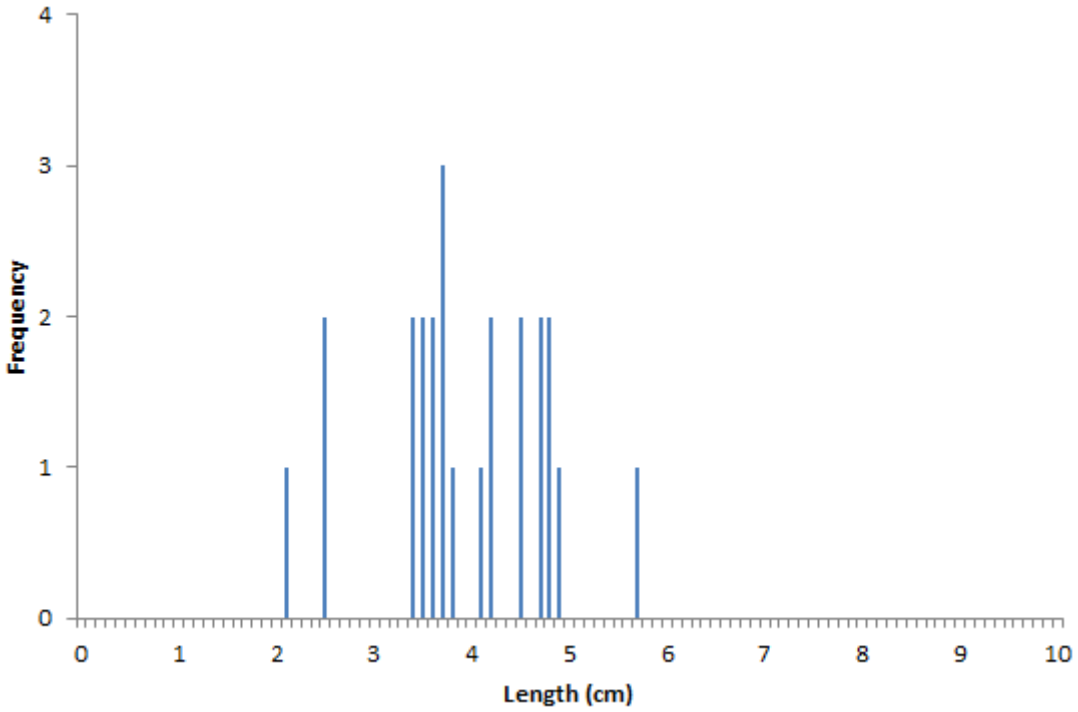

Figure 3.23. Length frequency of minnow captured at Rhinefield (n=24).

3.8.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Dames Slough Site 1 during the electric fishing survey.

Table 3.30. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Rhinefield.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	Y
Bullhead	Habitats Directive (Annex II)	Y	Y
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	N
Lamprey (Brook)	Habitats Directive (Annex II)	Y	Y
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.9 Slufters

3.9.1 Site description

The Slufters site is located within an area of broadleaf / mixed woodland (see Section 2.1.6). Table 3.31 below summarises the key physical characteristics of the 100 m survey site, and Appendix 9 provides a photographic record of habitat variability. The mean wetted width was 2.11 m, with an overall surveyed area of 210.9 m^2.

This site was a post-recent restoration works site. Full details of the restoration works are unknown; however, it is understood that the survey site comprised a newly excavated channel, with a view to re-instating historic meanders at this location. Substrate was mainly silt, with a deep layer of underlying soft clay. Water depths were mainly shallow throughout, with limited bankside cover or fish holding areas present.

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.32.

Table 3.31. Habitat data recorded during the electric fishing survey at Slufters.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	40	40	10	10				
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent	10	70		10	5	5		
Instream vegetation: **20 %**		Silted? **Yes**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent	10	10	40		20		20	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	2	2		2	2			
Right bank %	2	2		2	2			
Total LB fish cover: **8 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **8 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / **Simple** / Complex				RB Bankface vegetation: Bare / Uniform / **Simple** / Complex				
LB Banktop vegetation: Bare / Uniform / **Simple** / Complex				RB Banktop vegetation: Bare / Uniform / **Simple** / Complex				
LB Overhanging Boughs (%): **0**			RB Overhanging Boughs (%): **0**			Canopy Cover (%): **70**		

Table 3.32. Physico-chemical parameters recorded during fish survey at Slufters.

Parameter	Value
Temperature (°C)	16.3
Dissolved Oxygen (%)	95.8
Dissolved Oxygen (mgl^{-1})	9.39
pH	7.16
Conductivity (μScm^{-1})	103.8

3.9.2 Electric fishing survey results

A total of 168 fish were captured at Slufters, comprising five species. Minnow was the most abundant species captured, followed by stoneloach and bullhead (Figure 3.24).

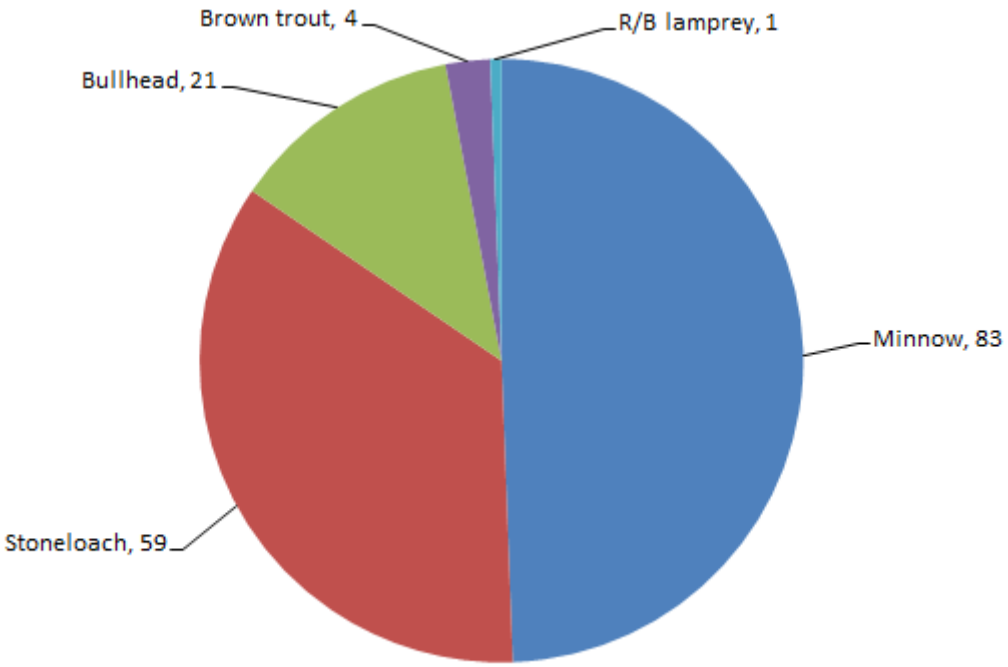

Figure 3.24. Species composition (total number captured) at Slufters.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.33. The National Fisheries Classification Scheme (NFCS) classifications for 0+ and 1++ brown trout are also shown.

Table 3.33. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Slufters. National Fisheries Classification Scheme (NFCS) grades are also provided for brown trout.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)	NFCS Classification
Minnow	83	85	0.69	81	89	40	N/A
Stoneloach	59	70	0.57	54	86	33	N/A
Bullhead	21	22	0.58	18	26	10	N/A
Brown trout (0+)	3	3	0.75	2	4	1	E (Poor)
Brown trout (1++)	1	1	0.50	0	2	<1	E (Poor)
R/B lamprey	1	1	0.33	-3	5	<1	N/A
TOTAL	**168**						

Length frequency charts for the most abundant fish species recorded are provided in Figure 3.2 to Figure 3.27 below. Where relevant, age cohorts (0+ and 1++) have been displayed on the charts; however, in the absence of age and growth analysis, it is emphasised that these are indicative only.

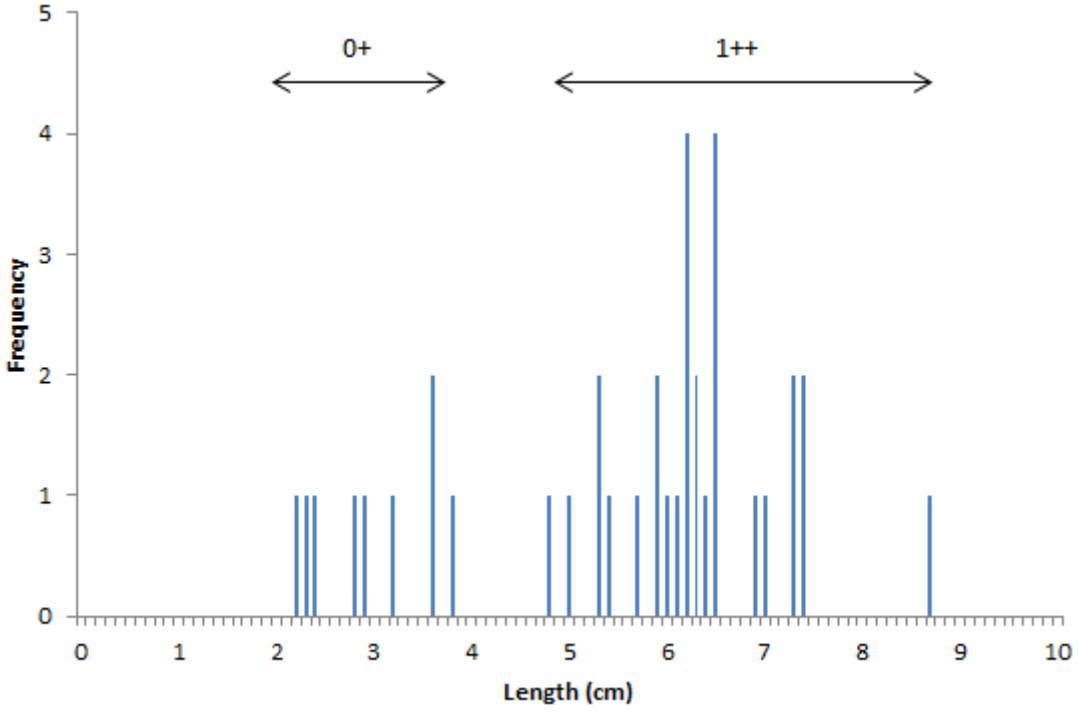

Figure 3.25. Length frequency of minnow captured at Slufters (n=37). In the absence of growth analysis, highlighted age cohorts are indicative only.

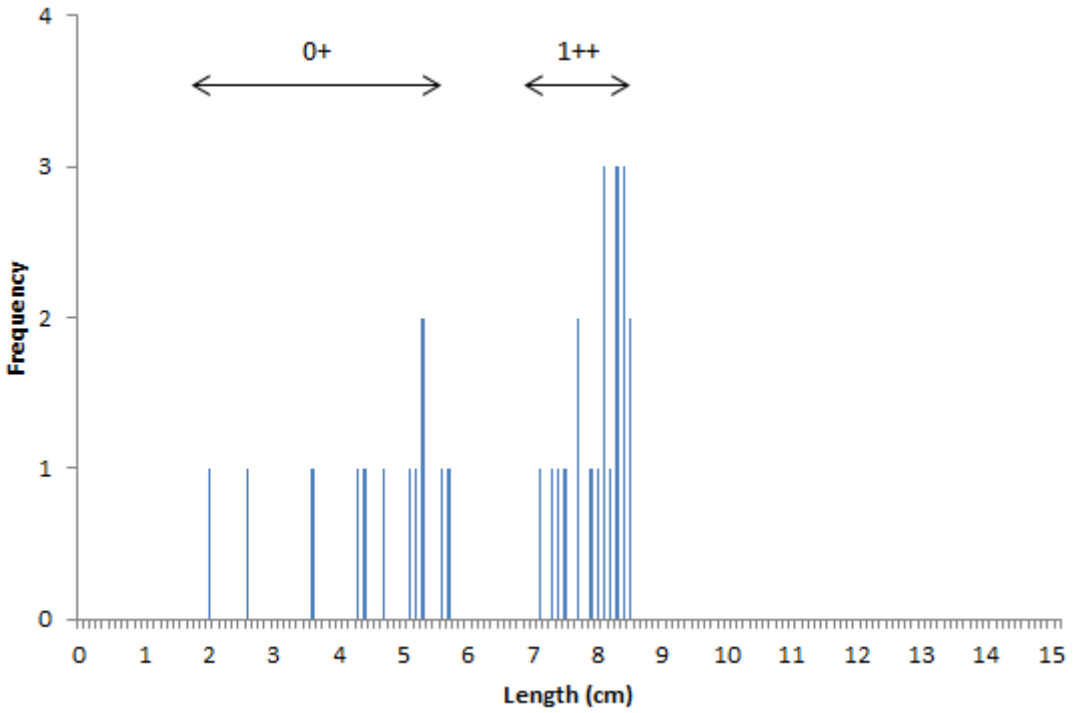

Figure 3.26. Length frequency of stoneloach captured at Slufters (n=32). In the absence of growth analysis, highlighted age cohorts are indicative only.

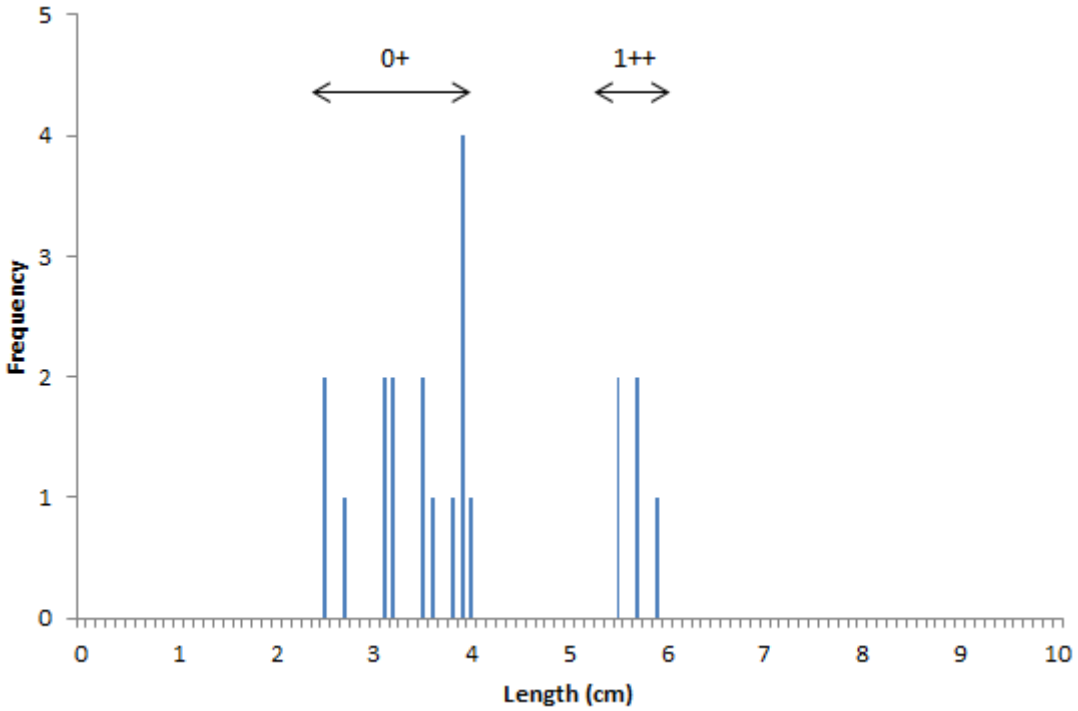

Figure 3.27. Length frequency of bullhead captured at Slufters (n=21). In the absence of growth analysis, highlighted age cohorts are indicative only.

3.9.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Dames Slough Site 1 during the electric fishing survey.

Table 3.34. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Slufters.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	Y
Bullhead	Habitats Directive (Annex II)	Y	Y
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	N
Lamprey (Brook)	Habitats Directive (Annex II)	Y	Y
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.10 Wootton Phase 1 Site 1

3.10.1 Site description

Wootton Phase 1 Site 1 is located within an area of broadleaf / mixed woodland (see Section 2.1.8). Table 3.35 below summarises the key physical characteristics of the 100 m survey site, and Appendix 10 provides a photographic record of habitat variability. The mean wetted width was 1.95 m, with an overall surveyed area of 195.5 m^2.

This site was a post-recent restoration works site. Full details of the restoration works are unknown; however, it is understood that the survey site comprised reinstatement of a historic meandering channel. Substrate comprised mainly a mixture of silt/clay, gravel and pebbles.

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.36.

Table 3.35. Habitat data recorded during the electric fishing survey at Wootton Phase 1 Site 1.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	10	20	20	20	20	10		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent		30		30	30	10		
Instream vegetation: **0 %**		Silted? **Yes**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent		10	10	10	20	40	10	
Speed / Level: **Mod**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	10	10			5			
Right bank %	10	10			5			
Total LB fish cover: **25 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **25 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / **Simple** / Complex				RB Bankface vegetation: Bare / Uniform / **Simple** / Complex				
LB Banktop vegetation: Bare / Uniform / **Simple** / Complex				RB Banktop vegetation: Bare / Uniform / **Simple** / Complex				
LB Overhanging Boughs (%): **5**			RB Overhanging Boughs (%): **5**			Canopy Cover (%): **90**		

Table 3.36. Physico-chemical parameters recorded during fish survey at Wootton Phase 1 Site 1.

Parameter	Value
Temperature (°C)	12.9
Dissolved Oxygen (%)	92.7
Dissolved Oxygen (mgl^{-1})	9.79
pH	7.03
Conductivity (μScm^{-1})	128.0

3.10.2 Electric fishing survey results

A total of 54 fish were captured at Wootton Phase 1 Site 1, comprising six species. Brown trout was the most abundant species captured, followed by minnow and bullhead (Figure 3.28).

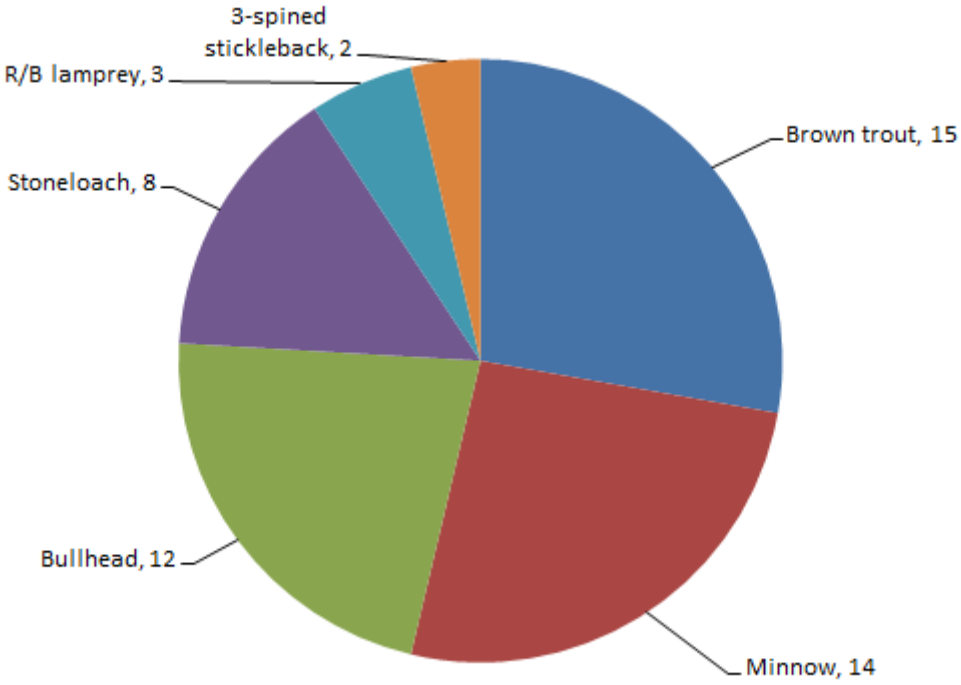

Figure 3.28. Species composition (total number captured) at Wootton Phase 1 Site 1.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.37. The National Fisheries Classification Scheme (NFCS) classifications for 0+ and 1++ brown trout are also shown.

Table 3.37. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Wootton Phase 1 Site 1. National Fisheries Classification Scheme (NFCS) grades are also provided for brown trout.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)	NFCS Classification
Brown trout (0+)	11	12	0.50	7	17	6	D (Fair / Poor)
Brown trout (1++)	4	4	0.57	2	6	2	D (Fair / Poor)
Minnow	14	15	0.52	10	20	8	N/A
Bullhead	12	13	0.52	8	18	7	N/A
Stoneloach	8	10	0.36	0	20	5	N/A
R/B lamprey	3	3	0.50	1	5	2	N/A
3-spined stickleback	2	2	1.00	2	2	1	N/A
TOTAL	**54**						

Length frequency charts for the most abundant fish species recorded are provided in Figure 3.29 to Figure 3.31 below. Where relevant, age cohorts (0+ and 1++) have been displayed on the charts; however, in the absence of age and growth analysis, it is emphasised that these are indicative only.

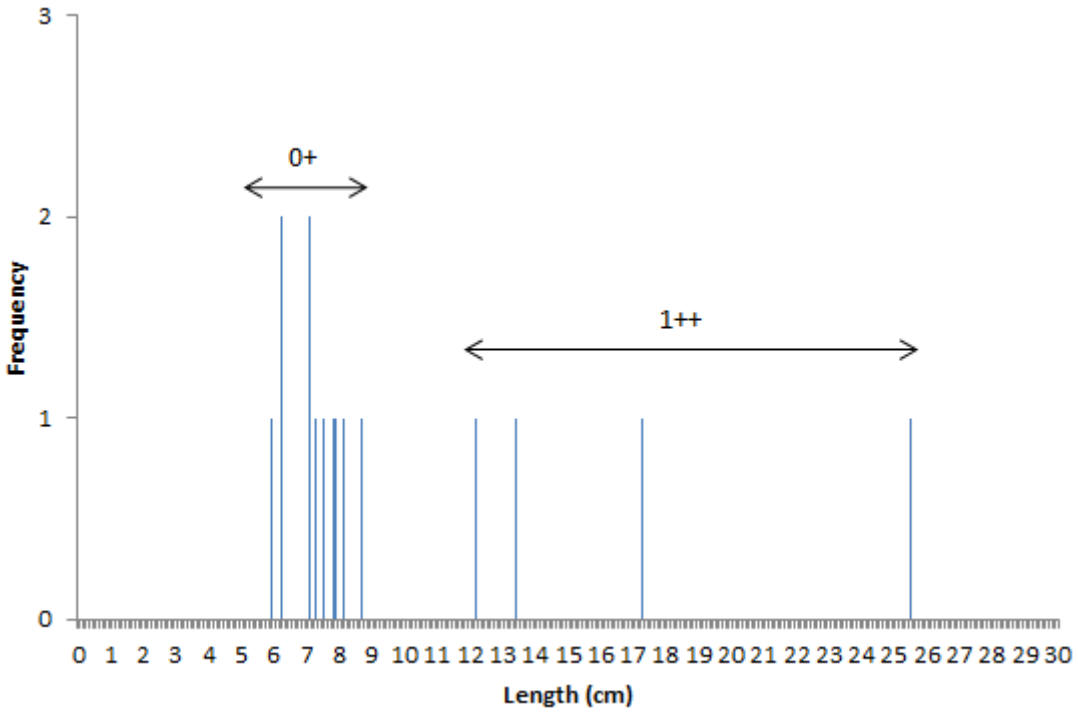

Figure 3.29. Length frequency of brown trout captured at Wootton Phase 1 Site 1 (n=15). In the absence of growth analysis, highlighted age cohorts are indicative only.

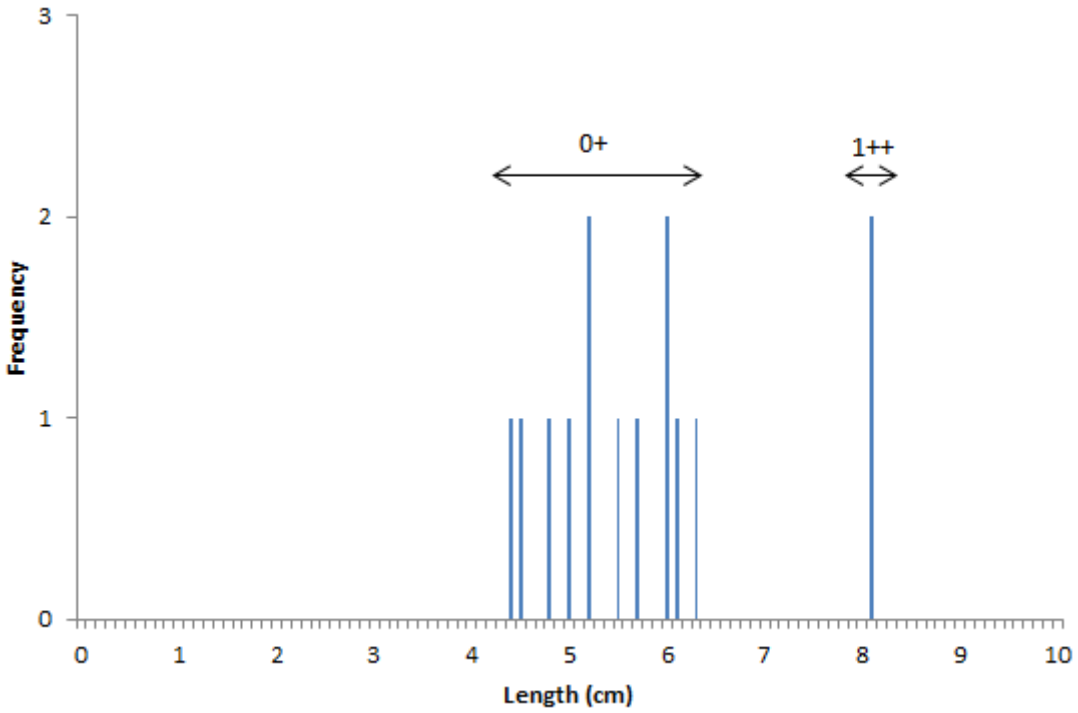

Figure 3.30. Length frequency of minnow captured at Wootton Phase 1 Site 1 (n=14). In the absence of growth analysis, highlighted age cohorts are indicative only.

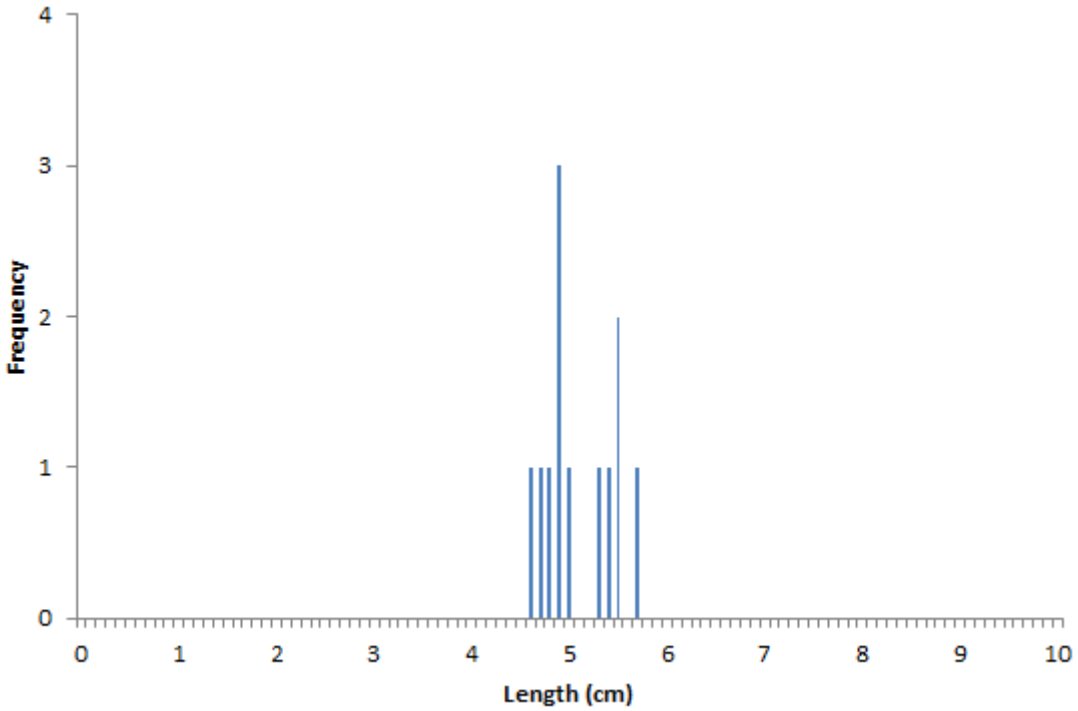

Figure 3.31. Length frequency of bullhead captured at Wootton Phase 1 Site 1 (n=12).

3.10.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Wootton Phase 1 Site 1 during the electric fishing survey.

Table 3.38. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Wootton Phase 1 Site 1.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	Y
Bullhead	Habitats Directive (Annex II)	Y	Y
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	N
Lamprey (Brook)	Habitats Directive (Annex II)	Y	Y
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.11 Wootton Phase 1 Site 2

3.11.1 Site description

Wootton Phase 1 Site 2 is located within an area of rough pasture (see Section 2.1.8). Table 3.39 below summarises the key physical characteristics of the 70 m survey site, and Appendix 11 provides a photographic record of habitat variability. The mean wetted width was 2.45 m, with an overall surveyed area of 171.5 m^2.

Substrate mainly comprised gravel and pebble, with some sand and silt. Although the channel was relatively straight in areas; abundant bankside cover and marginal vegetation was present throughout, and stream characteristics appeared typical of salmonid habitat.

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.40.

Table 3.39. Habitat data recorded during the electric fishing survey at Wootton Phase 1 Site 2.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	5	5	40	30	10	10		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent		10	10	40	40			
Instream vegetation: **10 %**		Silted? **Yes**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent		20	10	10	10	40	10	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	30	10		5	5			
Right bank %	30	10		5	5			
Total LB fish cover: **50 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **50 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / Simple / **Complex**				RB Bankface vegetation: Bare / Uniform / Simple / **Complex**				
LB Banktop vegetation: Bare / Uniform / Simple / **Complex**				RB Banktop vegetation: Bare / Uniform / Simple / **Complex**				
LB Overhanging Boughs (%): **20**			RB Overhanging Boughs (%): **20**			Canopy Cover (%): **70**		

Table 3.40. Physico-chemical parameters recorded during fish survey at Wootton Phase 1 Site 2.

Parameter	Value
Temperature (°C)	12.8
Dissolved Oxygen (%)	87.7
Dissolved Oxygen (mgl^{-1})	9.27
pH	6.45
Conductivity (μScm^{-1})	111.8

3.11.2 Electric fishing survey results

A total of 70 fish were captured at Wootton Phase 1 Site 2, comprising four species. Brown trout was the most abundant species captured, followed by bullhead and minnow (Figure 3.32).

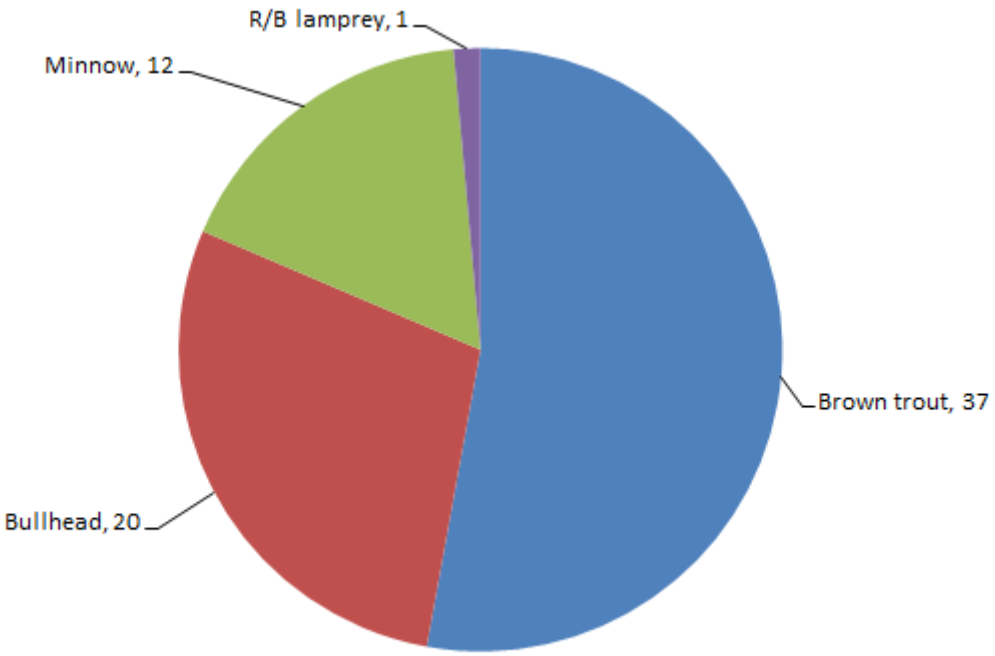

Figure 3.32. Species composition (total number captured) at Wootton Phase 1 Site 2.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.41. The National Fisheries Classification Scheme (NFCS) classifications for 0+ and 1++ brown trout are also shown.

Table 3.41. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Wootton Phase 1 Site 2. National Fisheries Classification Scheme (NFCS) grades are also provided for brown trout.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)	NFCS Classification
Brown trout (1++)	27	28	0.61	24	32	16	B (Good)
Brown trout (0+)	10	13	0.34	0	26	8	C (Fair)
Bullhead	20	40	0.20	-33	113	23	N/A
Minnow	12	15	0.38	3	27	9	N/A
R/B lamprey	1	1	0.33	-3	5	1	N/A
TOTAL	**70**						

Length frequency charts for the most abundant fish species recorded are provided in Figure 3.33 to Figure 3.35 below. Where relevant, age cohorts (0+ and 1++) have been displayed on the charts; however, in the absence of age and growth analysis, it is emphasised that these are indicative only.

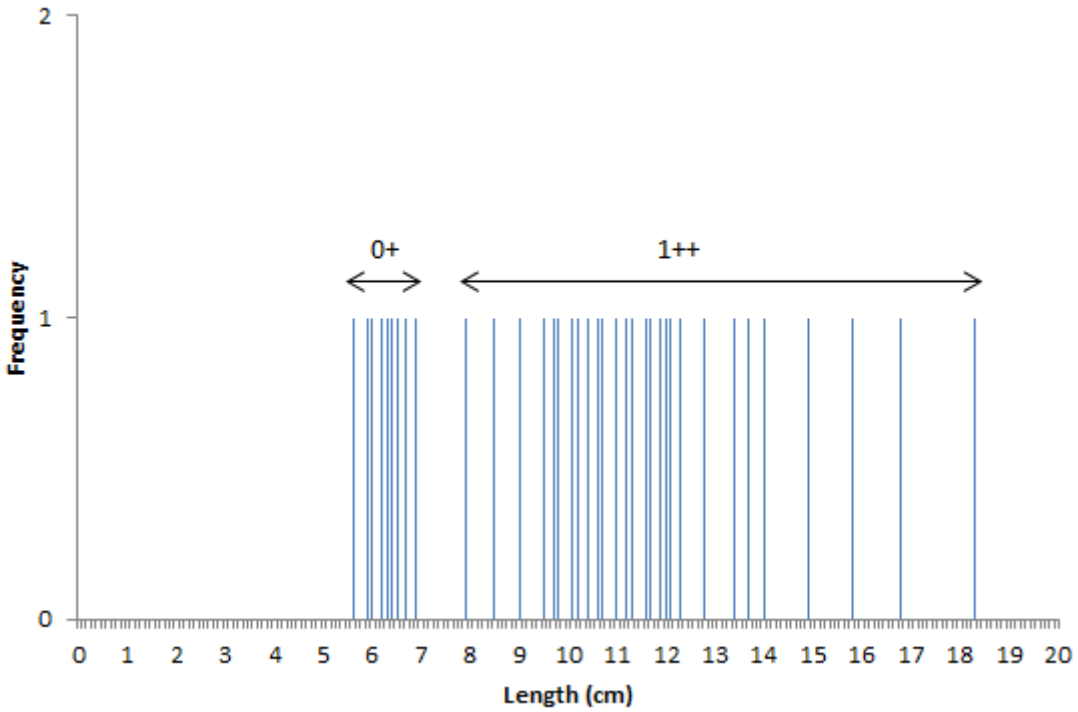

Figure 3.33. Length frequency of brown trout captured at Wootton Phase 1 Site 2 (n=37). In the absence of growth analysis, highlighted age cohorts are indicative only.

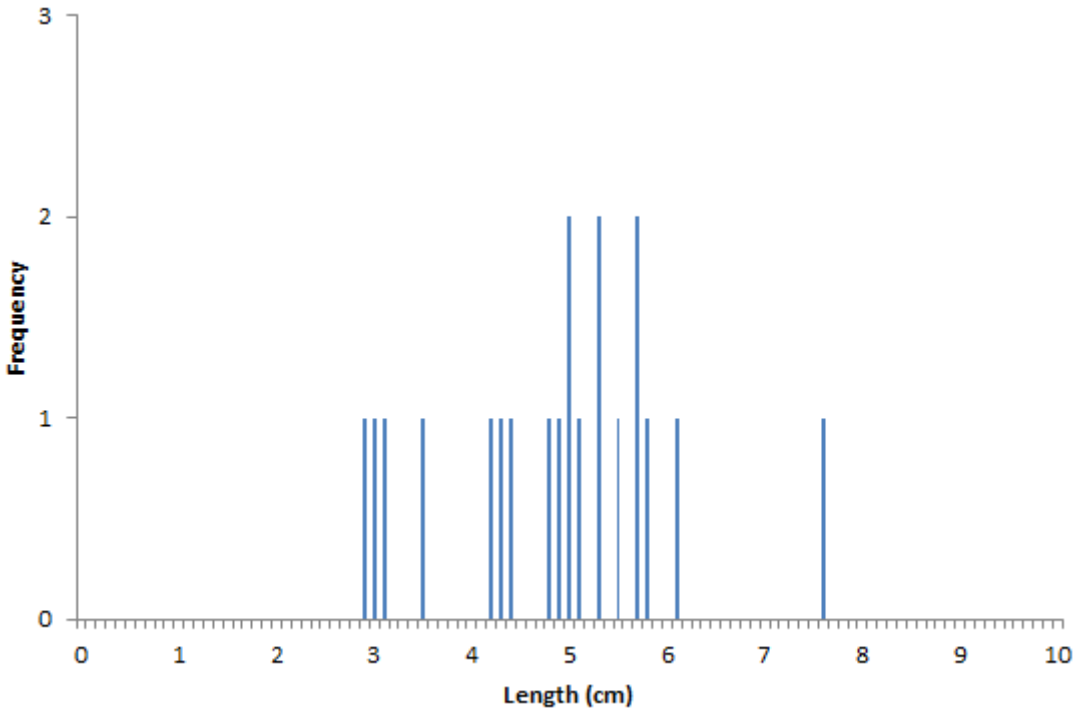

Figure 3.34. Length frequency of bullhead captured at Wootton Phase 1 Site 2 (n=20).

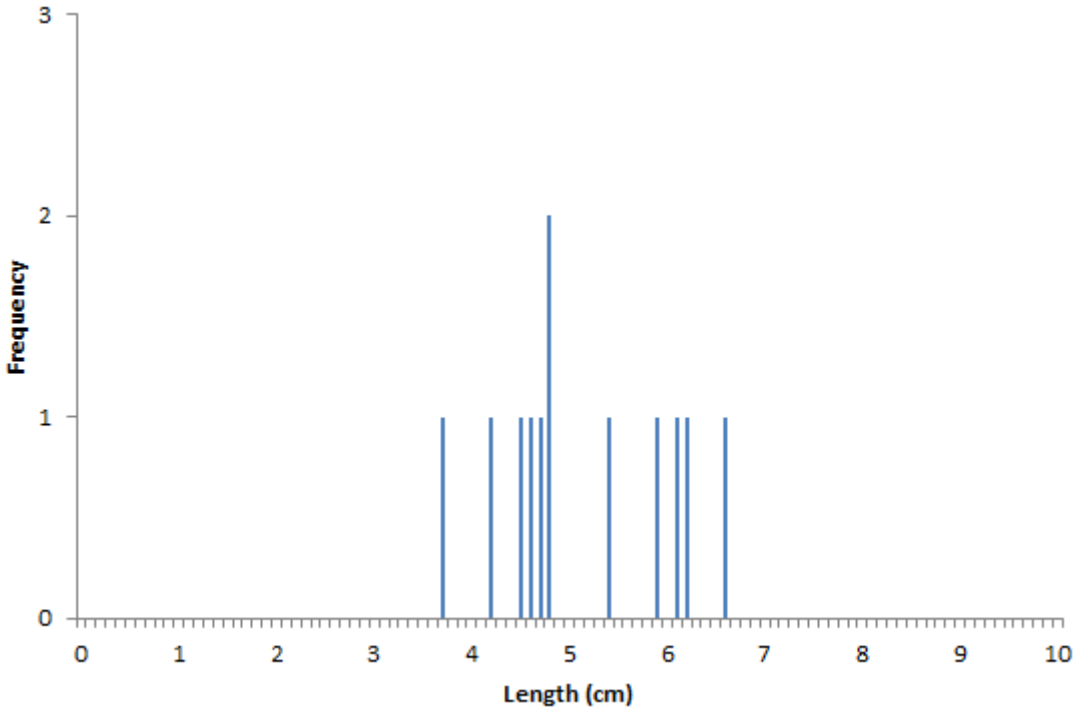

Figure 3.35. Length frequency of minnow captured at Wootton Phase 1 Site 2 (n=12).

3.11.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Dames Slough Site 1 during the electric fishing survey.

Table 3.42. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Wootton Phase 1 Site 2.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	Y
Bullhead	Habitats Directive (Annex II)	Y	Y
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	N
Lamprey (Brook)	Habitats Directive (Annex II)	Y	Y
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

3.12 Wootton Phase 2

3.12.1 Site description

Wootton Phase 2 is located within an area of broadleaf / mixed woodland (see Section 2.1.9). Table 3.43 below summarises the key physical characteristics of the 100 m survey site, and Appendix 12 provides a photographic record of habitat variability. The mean wetted width was 3.75 m, with an overall surveyed area of 374.5 m^2.

Substrate mainly comprised gravel and pebble, with some sand and silt. Although the channel was relatively straight; abundant bankside cover, marginal vegetation and holding pools were present throughout, and stream characteristics appeared typical of salmonid habitat.

Physico-chemical parameters recorded during the time of the survey are provided in Table 3.44.

Table 3.43. Habitat data recorded during the electric fishing survey at Wootton Phase 2.

Depths (cm)	**< 10**	**11 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**> 50**		
Percent	10	20	20	20	20	10		
Substrate	**Organic**	**Silt**	**Sand**	**Gravel**	**Pebble**	**Cobble**	**Boulder**	**Bedrock**
Percent		5	5	40	50			
Instream vegetation: **0 %**		Silted? **No**		Substrate: **Stable** & **Uncompacted**				
Flow	**SM**	**DP**	**SP**	**DG**	**SG**	**RU**	**RI**	**TO**
Percent		10	10	10	10	50	10	
Speed / Level: **Low**	FLOW DEFINITIONS: SM <10cm still/eddy, smooth, silent; DP ≥30cm slow/eddy, smooth, silent; SP <30cm slow/eddy, smooth, silent; DG ≥30cm mod/fast, smooth, silent; SG <30cm mod/fast, smooth, silent; RU fast, unbroken waves, silent; RI fast, broken waves, audible; TO white water, noisy, substrate invisible							
Bankside cover	**UC**	**DR**	**BA**	**MA**	**RT**	**RK**	**OTH**	
Left bank %	40	5			5			
Right bank %	40	5			5			
Total LB fish cover: **50 %**	DEFINITIONS: UC undercut banks; DR vegetation rooted in riparian zone, branches/leaves touch or almost touch surface; BA no cover or fish can't get to cover due to lack of water; MA veg rooted in stream, excl fully aquatic veg; RT cover provided by exposed roots; RK cover from rocks within bank structure; OTH other bankside cover							
Total RB fish cover: **50 %**								
Bankside land use								
LB Bankface vegetation: Bare / Uniform / Simple / **Complex**				RB Bankface vegetation: Bare / Uniform / Simple / **Complex**				
LB Banktop vegetation: Bare / Uniform / Simple / **Complex**				RB Banktop vegetation: Bare / Uniform / Simple / **Complex**				
LB Overhanging Boughs (%): **25**			RB Overhanging Boughs (%): **25**			Canopy Cover (%): **90**		

Table 3.44. Physico-chemical parameters recorded during fish survey at Wootton Phase 2.

Parameter	Value
Temperature (°C)	12.8
Dissolved Oxygen (%)	93.9
Dissolved Oxygen (mgl^{-1})	9.94
pH	6.84
Conductivity (μScm^{-1})	123.6

3.12.2 Electric fishing survey results

A total of 109 fish were captured at Wootton Phase 2, comprising six species. Brown trout was the most abundant species captured, followed by stoneloach and bullhead (Figure 3.36).

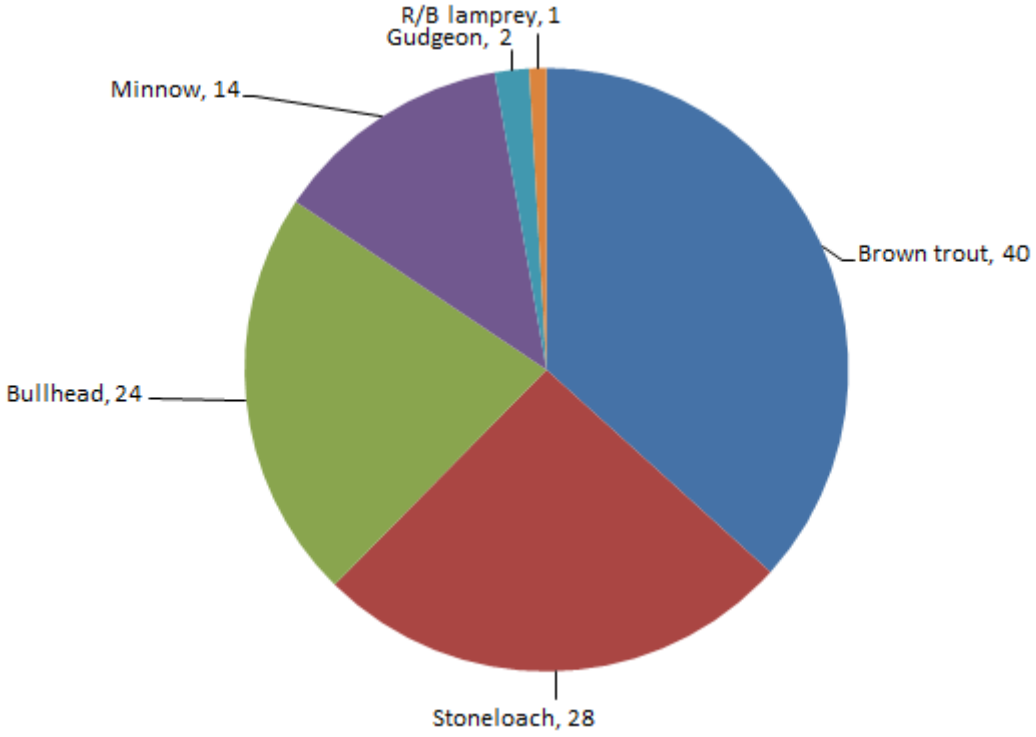

Figure 3.36. Species composition (total number captured) at Wootton Phase 2.

The total number captured, length range (cm) and catch depletion density estimate for each fish species are shown in Table 3.45. The National Fisheries Classification Scheme (NFCS) classifications for 0+ and 1++ brown trout are also shown.

Table 3.45. Number captured and catch depletion estimates (Carle & Strub), including Upper and Lower 95 % Confidence Intervals, for all species recorded at Wootton Phase 2. National Fisheries Classification Scheme (NFCS) grades are also provided for brown trout.

Species	No. captured (length range, cm)	Catch depletion population estimate	Catch depletion probability of capture	Catch depletion 95% LCI	Catch depletion 95% UCI	Catch depletion density (No./100m^2)	NFCS Classification
Brown trout (1++)	30	38	0.39	21	55	10	C (Fair)
Brown trout (0+)	10	10	0.83	10	10	3	D (Fair / Poor)
Stoneloach	28	29	0.64	26	32	8	N/A
Bullhead	24	25	0.62	21	29	7	N/A
Minnow	14	14	0.70	12	16	4	N/A
Gudgeon	2	2	1.00	2	2	1	N/A
R/B lamprey	1	1	1.00	1	1	<1	N/A
TOTAL	**109**						

Length frequency charts for the most abundant fish species recorded are provided in Figure 3.37 to Figure 3.40 below. Where relevant, age cohorts (0+ and 1++) have been displayed on the charts; however, in the absence of age and growth analysis, it is emphasised that these are indicative only.

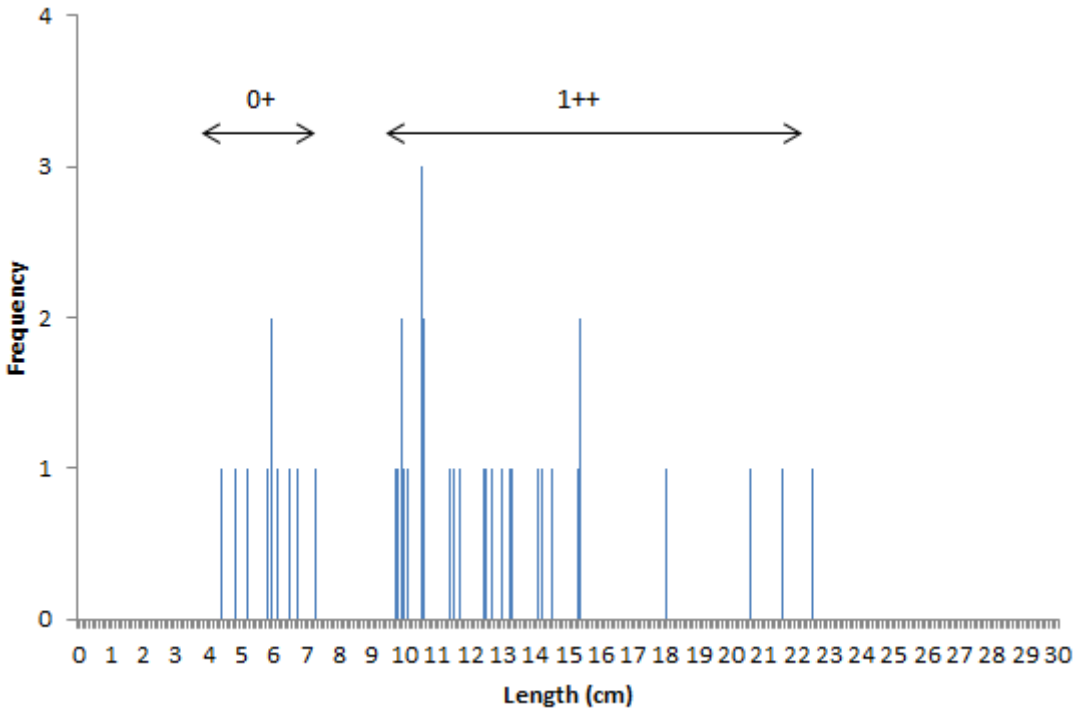

Figure 3.37. Length frequency of brown trout captured at Wootton Phase 2 (n=40). In the absence of growth analysis, highlighted age cohorts are indicative only.

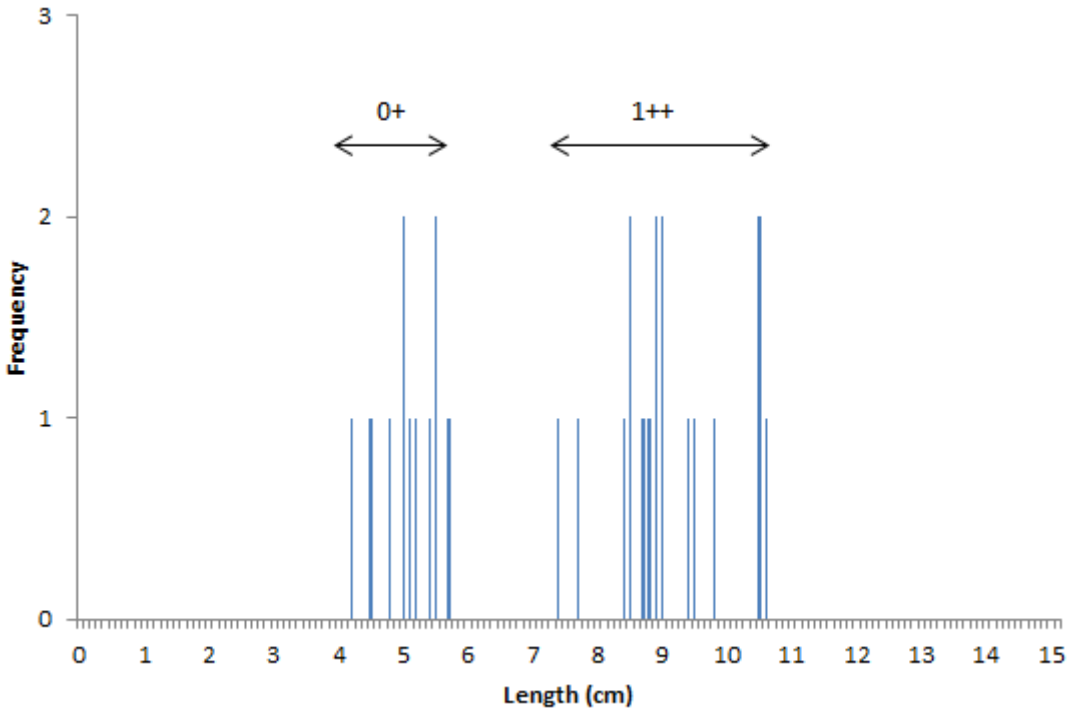

Figure 3.38. Length frequency of stoneloach captured at Wootton Phase 2 (n=28). In the absence of growth analysis, highlighted age cohorts are indicative only.

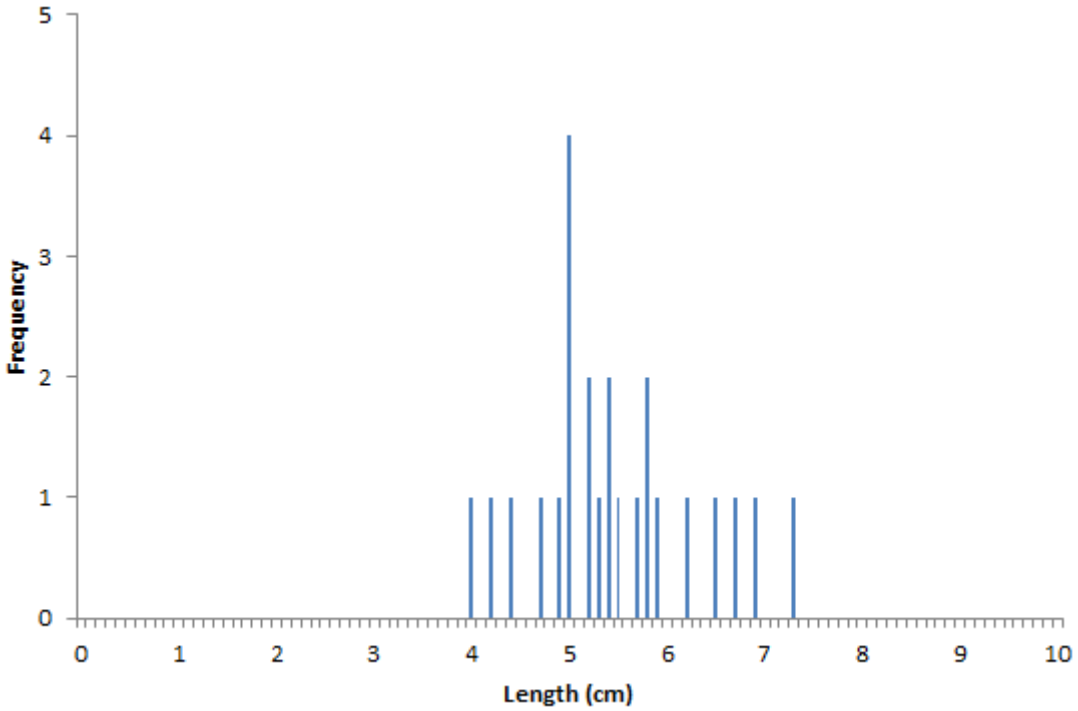

Figure 3.39. Length frequency of bullhead captured at Wootton Phase 2 (n=24).

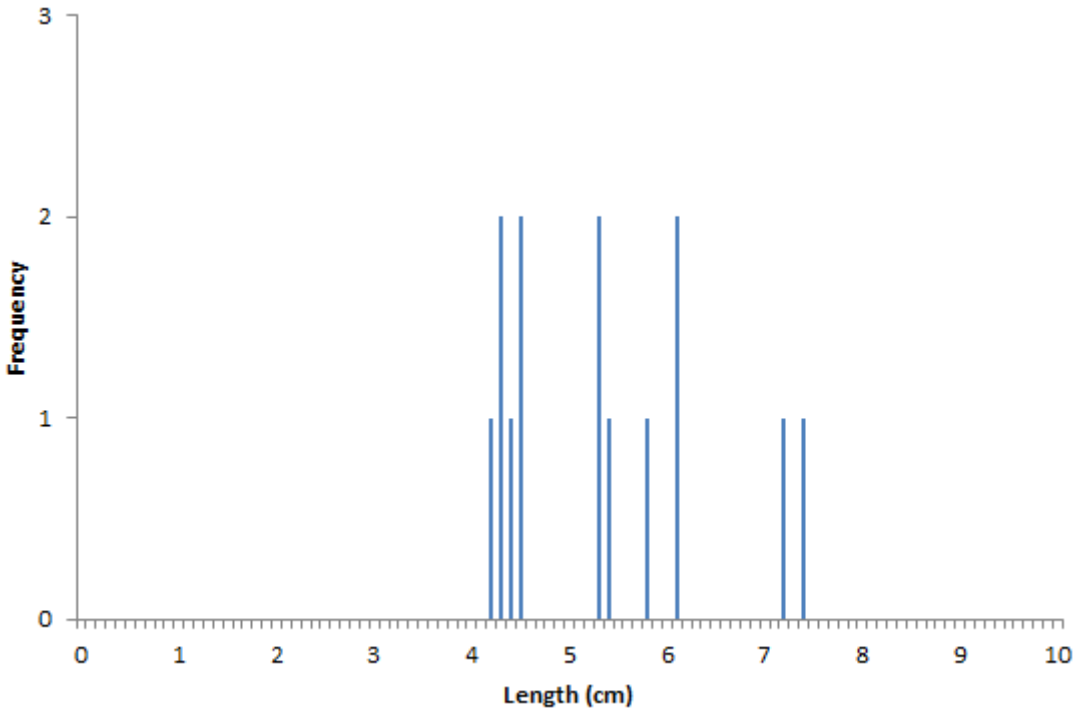

Figure 3.40. Length frequency of minnow captured at Wootton Phase 2 (n=14).

3.12.3 Fish species of conservation importance

Table 3.4 highlights the fish species of conservation importance that were recorded at Wootton Phase 2 during the electric fishing survey.

Table 3.46. Species of conservation importance that could potentially be present and species that were recorded during the fish survey at Wootton Phase 2.

Species	Conservation designation	Within natural range?[1]	Recorded?
Brown trout / Sea trout	UK BAP (Priority Species)	Y	Y
Bullhead	Habitats Directive (Annex II)	Y	Y
Eel	EC Eel Regulation (Eels [England and Wales] Regulations, IUCN Red List (Critically Endangered), UK BAP (Priority Species)	Y	N
Lamprey (Brook)	Habitats Directive (Annex II)	Y	Y
Lamprey (River)	Habitats Directive (Annex II)	Y[2]	N
Lamprey (Sea)	Habitats Directive (Annex II)	Y[2]	N
Salmon	UK BAP (Priority Species), Habitats Directive (Annex II)	Y[3]	N

[1] Natural range as summarised in Maitland (2004) distribution maps of fish occurring in the fresh waters of Britain and Ireland.

[2] River and sea lamprey are anadromous species found around the coast of the UK and, therefore, both species could potentially colonise the New Forest streams. However, it is generally accepted that brook lamprey is the only species to inhabit the New Forest streams. All lamprey recorded are, therefore, assumed to be brook lamprey.

[3] As an anadromous species, salmon have the ability to colonise any rivers with access to/from the sea. However, it is generally accepted that sea trout is the only migratory salmonid species present within the New Forest Streams.

4. RESULTS – INVERTEBRATE SURVEYS

4.1 Species composition

4.1.1 Latchmore Brook Site 1

Macroinvertebrate species composition recorded at Latchmore Brook Site 1 is presented in Table 4.1 below.

Table 4.1. Macroinvertebrate species composition at Latchmore Brook Site 1.

Group	Species	Number recorded
Snails	*Radix balthica* (Linnaeus, 1758)	4
Bivalves	*Sphaerium* sp.	16
	Pisidium sp.	16
Worms	*Oligochaeta*	192
Leeches	*Glossiphonia* sp.	1
	Helobdella stagnalis (Linnaeus, 1758)	16
	Erpobdella octoculata (Linnaeus, 1758)	3
Cladocerans	Cladocera sp.	4
Crustaceans	*Asellus aquaticus* (Linnaeus, 1758)	16
	Crangonyx pseudogracilis Bousfield, 1958	384
Mayflies	*Cloeon* sp.	1
	Paraleptophlebia sp.	16
Stoneflies	*Nemoura* sp.	32
	Leuctra fusca (Linnaeus, 1758)	64
Dragonflies and Damselflies	Odonata sp.	2
	Coenagrion sp.	8
	Calopteryx splendens (Harris, 1782)	16
	Aeshna sp.	1
	Anax imperator Leach, 1815	1
	Corduliidae sp.	1
True Bugs	*Gerris lacustris* (Linnaeus, 1758)	3
	Hesperocorixa sp.	1
	Sigara (Sigara) sp.	1
	Sigara (Subsigara) fossarum (Leach, 1817)	1
Water Beetles	*Noterus clavicornis* (DeGeer, 1774)	1
	Limnebius truncatellus (Thunberg, 1794)	1
	Oulimnius sp.	16
Alderflies	*Sialis lutaria* (Linnaeus, 1758)	1
Caddisflies	*Hydroptila* sp.	2
	Cyrnus trimaculatus (Curtis, 1834)	32
	Polycentropus irroratus (Curtis, 1835)	16
	Lepidostoma hirtum (Fabricius, 1775)	16

Group	Species	Number recorded
	Leptoceridae sp.	3
	Mystacides sp.	1
	Oecetis testacea (Curtis, 1834)	16
True Flies	Tipulidae	16
	Ceratopogonidae	2
	Simuliidae	16
	Chironomidae	144
	Tabanidae	3
TOTAL NUMBER OF SPECIES		**40**

4.1.2 Latchmore Brook Site 2

Macroinvertebrate species composition recorded at Latchmore Brook Site 2 is presented in Table 4.2 below.

Table 4.2. Macroinvertebrate species composition at Latchmore Brook Site 2.

Group	Species	Number recorded
Bivalves	*Pisidium* sp.	6
Worms	*Oligochaeta*	132
Leeches	*Helobdella stagnalis* (Linnaeus, 1758)	3
	Erpobdella octoculata (Linnaeus, 1758)	5
Crustaceans	*Gammarus pulex* (Linnaeus, 1758)	216
Mayflies	*Paraleptophlebia* sp.	1
Stoneflies	*Nemoura* sp.	120
	Leuctra fusca (Linnaeus, 1758)	21
	Siphonoperla torrentium (Pictet, 1841)	1
Dragonflies and Damselflies	Coenagrionidae sp.	2
	Calopteryx splendens (Harris, 1782)	3
Water Beetles	*Oulimnius* sp.	2
	Oulimnius tuberculatus (Müller, 1806)	4
Caddisflies	*Cyrnus trimaculatus* (Curtis, 1834)	1
	Polycentropus irroratus (Curtis, 1835)	1
	Hydropsyche siltalai Döhler, 1963	3
	Lepidostoma hirtum (Fabricius, 1775)	28
	Leptoceridae sp.	2
True Flies	Simuliidae	8
	Chironomidae	8
TOTAL NUMBER OF SPECIES		**20**

4.1.3 Millersford Brook Site 1

Macroinvertebrate species composition recorded at Millersford Brook Site 1 is presented in Table 4.3 below.

Table 4.3. Macroinvertebrate species composition at Millersford Brook Site 1.

Group	Species	Number recorded
Worms	*Oligochaeta*	28
Crustaceans	*Niphargus aquilex* Schiodte, 1855	3
Stoneflies	*Leuctra nigra* (Olivier, 1811)	47
Dragonflies and Damselflies	*Enallagma cyathigerum* (Charpentier, 1840)	22
	Calopteryx sp.	1
	Cordulegaster boltonii (Donovan, 1807)	16
True Bugs	*Gerris lacustris* (Linnaeus, 1758)	2
Caddisflies	*Hydroptila* sp.	1
	Plectrocnemia conspersa (Curtis, 1834)	76
True Flies	Diptera sp.	1
	Limoniidae	1
	Culicidae	3
	Ceratopogonidae	16
	Simuliidae	152
	Chironomidae	72
TOTAL NUMBER OF SPECIES		**15**

4.1.4 Millersford Brook Site 2

Macroinvertebrate species composition recorded at Millersford Brook Site 2 is presented in Table 4.4 below.

Table 4.4. Macroinvertebrate species composition at Millersford Brook Site 2.

Group	Species	Number recorded
Snails	*Potamopyrgus antipodarum* (J.E.Gray, 1843)	3
Bivalves	*Pisidium* sp.	2
Worms	*Oligochaeta*	84
Water Mites	Hydracarina	1
Crustaceans	*Crangonyx pseudogracilis* Bousfield, 1958	16
Mayflies	*Baetis rhodani* (Pictet, 1843-1845)	16
	Paraleptophlebia sp.	8
Stoneflies	*Nemoura* sp.	15
	Leuctra fusca (Linnaeus, 1758)	60
Dragonflies and Damselflies	Coenagrionidae sp.	1

Group	Species	Number recorded
	Calopteryx sp.	1
	Cordulegaster boltonii (Donovan, 1807)	3
Water Beetles	*Limnius volckmari* (Panzer, 1793)	2
	Oulimnius sp.	9
	Oulimnius tuberculatus (Müller, 1806)	6
Caddisflies	*Cyrnus trimaculatus* (Curtis, 1834)	1
	Polycentropus flavomaculatus (Pictet, 1834)	8
	Polycentropus irroratus (Curtis, 1835)	8
	Hydropsyche siltalai Döhler, 1963	12
	Lepidostoma hirtum (Fabricius, 1775)	1
	Sericostoma personatum (Spence in Kirby & Spence, 1826)	3
	Leptoceridae sp.	1
	Mystacides sp.	1
True Flies	Culicidae	4
	Ceratopogonidae	4
	Simuliidae	2
	Chironomidae	72
TOTAL NUMBER OF SPECIES		**27**

4.1.5 Millersford Brook Site 3

Macroinvertebrate species composition recorded at Millersford Brook Site 3 is presented in Table 4.5 below.

Table 4.5. Macroinvertebrate species composition at Millersford Brook Site 3.

Group	Species	Number recorded
Snails	*Potamopyrgus antipodarum* (J.E.Gray, 1843)	288
Bivalves	*Pisidium* sp.	8
Worms	*Oligochaeta*	168
Leeches	*Helobdella stagnalis* (Linnaeus, 1758)	2
	Erpobdellidae sp.	1
Water Mites	Hydracarina	1
Crustaceans	*Crangonyx pseudogracilis* Bousfield, 1958	10
Mayflies	*Baetis rhodani* (Pictet, 1843-1845)	2
	Paraleptophlebia sp.	5
Stoneflies	*Nemoura* sp.	60
	Leuctra fusca (Linnaeus, 1758)	112
Dragonflies and Damselflies	*Enallagma cyathigerum* (Charpentier, 1840)	1
	Cordulegaster boltonii (Donovan, 1807)	8
Water Beetles	*Hydraena gracilis* Germar, 1824	1
	Hydraena nigrita Germar, 1824	1

Group	Species	Number recorded
	Elodes sp.	2
	Elmis aenea (Müller, 1806)	8
	Limnius volckmari (Panzer, 1793)	76
	Oulimnius sp.	28
	Oulimnius tuberculatus (Müller, 1806)	48
Caddisflies	*Rhyacophila dorsalis* (Curtis, 1834)	4
	Cyrnus trimaculatus (Curtis, 1834)	4
	Plectrocnemia conspersa (Curtis, 1834)	4
	Polycentropus flavomaculatus (Pictet, 1834)	24
	Polycentropus irroratus (Curtis, 1835)	4
	Hydropsyche siltalai Döhler, 1963	2
	Lepidostoma hirtum (Fabricius, 1775)	3
	Halesus sp.	1
	Chaetopteryx villosa (Fabricius, 1798)	1
	Silo pallipes (Fabricius, 1781)	4
	Sericostoma personatum (Spence in Kirby & Spence, 1826)	8
	Mystacides sp.	4
True Flies	Pediciidae	1
	Culicidae	2
	Ceratopogonidae	4
	Simuliidae	1
	Chironomidae	148
TOTAL NUMBER OF SPECIES		**37**

4.1.6 Slufters

Macroinvertebrate species composition recorded at Slufters is presented in Table 4.6 below.

Table 4.6. Macroinvertebrate species composition at Slufters.

Group	Species	Number recorded
Snails	*Potamopyrgus antipodarum* (J.E.Gray, 1843)	2
	Radix balthica (Linnaeus, 1758)	3
Bivalves	*Pisidium* sp.	3
Worms	*Oligochaeta*	660
Crustaceans	*Gammarus pulex* (Linnaeus, 1758)	64
Mayflies	*Centroptilum luteolum* (Müller, 1776)	3
	Alainites muticus (Linnaeus, 1758)	1
	Heptageniidae sp.	1
	Ephemera danica Müller, 1764	3
	Caenis luctuosa group	4
Stoneflies	*Nemoura* sp.	20

Group	Species	Number recorded
	Leuctra sp.	4
	Leuctra fusca (Linnaeus, 1758)	56
Dragonflies and Damselflies	*Cordulegaster boltonii* (Donovan, 1807)	1
True Bugs	*Aquarius najas* (DeGeer, 1773)	6
Water Beetles	Dytiscidae sp.	1
	Limnius volckmari (Panzer, 1793)	1
	Oulimnius sp.	9
	Oulimnius tuberculatus (Müller, 1806)	4
Alderflies	*Sialis lutaria* (Linnaeus, 1758)	2
Caddisflies	*Hydroptila* sp.	36
	Hydropsyche sp.	1
	Hydropsyche angustipennis (Curtis, 1834)	4
	Hydropsyche pellucidula (Curtis, 1834)	1
	Hydropsyche siltalai Döhler, 1963	17
	Lepidostomatidae sp.	3
	Sericostoma personatum (Spence in Kirby & Spence, 1826)	2
	Leptoceridae sp.	24
	Mystacides sp.	1
True Flies	Tipulidae	1
	Culicidae	1
	Ceratopogonidae	1
	Simuliidae	12
	Chironomidae	116
	Tabanidae	6
	Muscidae	2
TOTAL NUMBER OF SPECIES		**36**

4.1.7 Wootton Phase 1 Site 1

Macroinvertebrate species composition recorded at Wootton Phase 1 Site 1 is presented in Table 4.7 below.

Table 4.7. Macroinvertebrate species composition at Wootton Phase 1 Site 1.

Group	Species	Number recorded
Flatworms	Tricladida sp.	1
Snails	*Valvata* (*Cincinna*) *piscinalis* (O.F. Müller, 1774)	12
	Potamopyrgus antipodarum (J.E.Gray, 1843)	16
	Bithynia (*Bithynia*) *tentaculata* (Linnaeus, 1758)	4
	Radix balthica (Linnaeus, 1758)	1
	Hippeutis complanatus (Linnaeus, 1758)	1
Bivalves	*Sphaerium* sp.	8

Group	Species	Number recorded
	Pisidium sp.	52
Worms	*Oligochaeta*	60
Leeches	*Glossiphonia complanata* (Linnaeus, 1758)	5
Water Mites	Hydracarina	1
Ostracods	Ostracoda sp.	1
Crustaceans	*Asellus aquaticus* (Linnaeus, 1758)	56
	Gammarus pulex (Linnaeus, 1758)	48
Mayflies	*Baetis rhodani* (Pictet, 1843-1845)	56
Stoneflies	*Nemoura* sp.	32
	Leuctra fusca (Linnaeus, 1758)	4
Dragonflies and Damselflies	Coenagrionidae sp.	1
Water Beetles	Haliplidae sp.	1
	Limnius volckmari (Panzer, 1793)	4
	Oulimnius sp.	2
Alderflies	*Sialis lutaria* (Linnaeus, 1758)	2
Caddisflies	*Hydropsyche siltalai* Döhler, 1963	1
	Lepidostomatidae sp.	4
	Sericostoma personatum (Spence in Kirby & Spence, 1826)	8
True Flies	Limoniidae	2
	Ceratopogonidae	1
	Simuliidae	12
	Chironomidae	12
	Tabanidae	6
TOTAL NUMBER OF SPECIES		**30**

4.1.8 Wootton Phase 1 Site 2

Macroinvertebrate species composition recorded at Wootton Phase 1 Site 2 is presented in Table 4.8 below.

Table 4.8. Macroinvertebrate species composition at Wootton Phase 1 Site 2.

Group	Species	Number recorded
Flatworms	*Polycelis felina* (Dalyell, 1814)	10
Snails	*Potamopyrgus antipodarum* (J.E.Gray, 1843)	2
	Ancylus fluviatilis O.F. Müller, 1774	20
Bivalves	*Pisidium* sp.	12
Worms	*Oligochaeta*	328
Leeches	*Glossiphonia complanata* (Linnaeus, 1758)	4
	Helobdella stagnalis (Linnaeus, 1758)	8
	Erpobdella octoculata (Linnaeus, 1758)	7
Crustaceans	*Asellus aquaticus* (Linnaeus, 1758)	28

Group	Species	Number recorded
	Gammarus pulex (Linnaeus, 1758)	428
Mayflies	*Baetis rhodani* (Pictet, 1843-1845)	64
	Centroptilum luteolum (Müller, 1776)	2
	Paraleptophlebia sp.	5
	Serratella ignita (Poda, 1761)	32
Stoneflies	*Nemoura* sp.	172
	Leuctra fusca (Linnaeus, 1758)	3
Dragonflies and Damselflies	*Calopteryx splendens* (Harris, 1782)	6
Water Beetles	*Hydraena rufipes* Curtis, 1830	1
	Elmis aenea (Müller, 1806)	2
	Limnius volckmari (Panzer, 1793)	85
	Oulimnius sp.	14
Alderflies	*Sialis lutaria* (Linnaeus, 1758)	1
Caddisflies	*Rhyacophila dorsalis* (Curtis, 1834)	1
	Glossosomatidae sp.	1
	Hydropsyche siltalai Döhler, 1963	3
	Lepidostoma hirtum (Fabricius, 1775)	104
	Limnephilidae sp.	2
	Hydatophylax infumatus (McLachlan, 1865)	6
	Potamophylax group	1
	Limnephilus lunatus Curtis, 1834	5
	Sericostoma personatum (Spence in Kirby & Spence, 1826)	28
	Mystacides sp.	1
True Flies	Limoniidae	3
	Culicidae	2
	Ceratopogonidae	1
	Simuliidae	20
	Chironomidae	52
	Tabanidae	1
TOTAL NUMBER OF SPECIES		**38**

4.1.9 Wootton Phase 2

Macroinvertebrate species composition recorded at Wootton Phase 2 is presented in Table 4.9 below.

Table 4.9. Macroinvertebrate species composition at Wootton Phase 2.

Group	Species	Number recorded
Snails	*Radix balthica* (Linnaeus, 1758)	1
	Ancylus fluviatilis O.F. Müller, 1774	8
Bivalves	*Pisidium* sp.	20

Group	Species	Number recorded
Worms	*Oligochaeta*	56
Crustaceans	*Asellus aquaticus* (Linnaeus, 1758)	5
	Gammarus pulex (Linnaeus, 1758)	224
Mayflies	*Baetis rhodani* (Pictet, 1843-1845)	24
	Alainites muticus (Linnaeus, 1758)	2
	Serratella ignita (Poda, 1761)	1
Stoneflies	*Leuctra fusca* (Linnaeus, 1758)	64
Dragonflies and Damselflies	*Calopteryx* sp.	1
Water Beetles	*Orectochilus villosus* (O.F. Müller, 1776)	6
	Elmis aenea (Müller, 1806)	4
	Limnius volckmari (Panzer, 1793)	204
	Oulimnius sp.	1
	Oulimnius tuberculatus (Müller, 1806)	1
Caddisflies	*Hydropsyche siltalai* Döhler, 1963	12
	Lepidostoma hirtum (Fabricius, 1775)	4
	Silo pallipes (Fabricius, 1781)	12
	Sericostoma personatum (Spence in Kirby & Spence, 1826)	3
	Leptoceridae sp.	1
True Flies	Limoniidae	2
	Pediciidae	1
	Simuliidae	5
	Chironomidae	44
TOTAL NUMBER OF SPECIES		**25**

4.2 RIVPACS Predictor Variables

RIVPACS predictor variables for each site are provided in Table 4.10 below.

Table 4.10. RIVPACS environmental predictor variables for the September 2017 RIVPACS samples (input values for RIVPACS). Origin of variables: [1]measured *in situ* and recorded on RIVPACS sample area form; [2]recorded *in situ* from handheld GPS; [3]derived from 1:50,000 Ordnance Survey map; [4]derived from discharge category map; [5]measured *in situ* with YSI hand-held meter).

Variable	SLU	WOO1-1	WOO1-2	WOO2	LAT1	LAT2	MIL1	MIL2	MIL3
[1]Sample date	13/09/17	21/09/17	21/09/17	20/09/17	12/09/17	12/09/17	14/09/17	13/09/17	14/09/17
[1]Method	K/S	K/S	K/S	K/S	K/S	K/S	K/S	K/S	K/S
[1]Duration	3min	3min	3min	3min	3min	3min	3min	3min	3min
[1]Kick Sampler	AP	AH	AH	AH	AP	AP	AH	AP	AH
[1]Recorder	AH	DF	DF	EN	AH	AH	CGR	AH	CGR
[2]NGR	SU 23164 09801	SZ 24837 99696	SU 23256 00425	SZ 26319 98912	SU 19095 12659	SU 18273 12480	SU 19580 17552	SU 18318 16197	SU 18966 16820
[2]Altitude (m)	65	28	35	22	47	43	75	55	65

Variable	SLU	WOO1-1	WOO1-2	WOO2	LAT1	LAT2	MIL1	MIL2	MIL3
[3]Slope (m km^{-1})	8.0	4.1	4.0	4.1	6.2	6.2	14.0	11.0	13.0
[4]Discharge (category)	1	1	1	1	1	1	1	1	1
[1]Velocity (category)	1	2	2	2	1	1	1	1	1
[3]Distance from source (km)	1.6	4.3	2.5	3.6	6.0	7.0	1.3	3.2	2.4
[1]Mean width (m)	1.3	3.2	2.1	4.0	3.0	3.5	1.3	2.5	2.0
[1]Depth at ¼ width (cm)	9	29	23	11	25	4	4	14	13
[1]Depth at ½ width (cm)	13	24	24	18	30	11	9	10	14
[1]Depth at ¾ width (cm)	11	15	20	15	25	21	9	6	10
[1]Mean depth (cm)	11.0	22.7	22.3	14.7	26.7	12.0	7.3	10.0	12.3
[1]Boulders and cobbles (%)	5	0	5	0	20	6	34	45	40
[1]Pebbles and gravel (%)	60	55	89	87	73	90	60	45	53
[1]Sand (%)	0	5	3	10	5	3	5	5	5
[1]Silt and clay (%)	35	40	3	3	2	1	1	5	2
[5]pH	7.2	7.0	6.4	6.8	7.2	7.6	4.7	7.3	7.8
[5]Temperature (°C)	16.3	12.9	12.8	12.8	14.4	12.9	13.0	13.0	11.6
[5]Conductivity (µs)	103.8	128.0	111.8	123.6	86.9	80.1	59.6	127.6	172.9
[5]Dissolved Oxygen (%)	95.8	92.7	87.7	93.9	102.5	98.4	101.2	89.5	93.8
[5]Dissolved Oxygen (mg l^{-1})	9.39	9.79	9.27	9.94	10.44	10.39	10.69	9.43	10.18
[1]Water clarity	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
[1]Water colour	Clear	Clear	Clear	Clear	Brown Colour	Slightly Brown	Clear	Clear	Clear
[1]Algae cover (%)	0	0	0	0	0	0	0	0	20
[1]Moss cover (%)	0	0	0	0	0	0	0	0	0
[1]Higher plant cover (%)	0	0	25	0	0	0	0	0	0
[1]Total cover (%)	0	0	25	0	0	0	0	0	20
[1]Detritus	Absent	Present	Present	Absent	Present	Present	Present	Present	Present

4.3 RIVPACS Stream Type Associations

RIVPACS stream type associations for each site are provided in Table 4.11 below.

Table 4.11. Stream type (environmental end-group associations) for the September 2017 RIVPACS samples (output values from RIVPACS; associations <0.01 not shown).

End Group	SLU	WOO1-1	WOO1-2	WOO2	LAT1	LAT2	MIL1	MIL2	MIL3
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21						0.01			
22									
23									
24						0.01			
25			0.01	0.01	0.21	0.35	0.01	0.03	0.01
26	0.01		0.01	0.01	0.18	0.17	0.01	0.19	0.13
27	0.85	0.02	0.86	0.45	0.36	0.24	0.96	0.72	0.83
28						0.01	0.01	0.03	0.02
29	0.01				0.01	0.02	0.01		
30	0.02								
31									
32									
33									
34									
35									
36									
37									
38									

End Group	SLU	WOO1-1	WOO1-2	WOO2	LAT1	LAT2	MIL1	MIL2	MIL3
39	0.02	0.02							
40	0.09	0.97	0.11	0.50	0.23	0.18		0.01	0.01
41									
42									
43									
Probability of model fit	> 5%	> 5%	> 5%	> 5%	> 5%	> 5%	> 5%	> 5%	> 5%
Suitability Code	1	1	1	1	1	1	1	1	1

4.4 RIVPACS Biotic Indices

Observed biotic indices, expected biotic indices and Observed/Expected ratios are provided in Table 4.12 below.

Table 4.12. Observed, Expected (reference condition), and Observed/Expected (O/E) ratios for the RIVPACS samples. Colour key: Blue = Better than expected, White = Within expected range, Yellow = Slightly degraded, Orange = Moderately degraded, Red = Very degraded.

Biotic Indices	SLU	WOO1-1	WOO1-2	WOO2	LAT1	LAT2	MIL1	MIL2	MIL3
OBSERVED biotic index values									
TL1 BMWP	144	106	157	121	145	111	69	120	157
TL1 NTAXA	24	22	27	20	26	18	12	19	26
TL1 ASPT	6.000	4.818	5.815	6.050	5.577	6.167	5.750	6.316	6.038
TL2 WHPT Score (AbW,DistFam)	165.8	126.0	185.2	124.2	153.4	111.2	78.1	132.3	171.6
TL2 WHPT NTAXA (AbW,DistFam)	28	25	31	20	28	18	14	21	28
TL2 WHPT ASPT (AbW,DistFam)	5.921	5.040	5.974	6.210	5.479	6.178	5.579	6.300	6.129
TL5 AWIC(Sp) Murphy	6.727	7.000	6.909	7.273	5.000	6.000	4.500	6.625	6.667
TL5 WFD AWIC(Sp) Mcfarland	9.182	9.714	9.818	10.000	7.000	8.200	5.000	8.750	8.750
TL5 LIFE(Sp)	7.500	7.000	7.720	8.176	6.529	7.667	7.571	7.467	7.583
TL5 PSI(Sp)	51.724	34.375	60.870	78.378	27.907	70.000	62.500	62.500	64.103
TL5 SPEAR(Sp) %	29.295	30.041	41.103	34.741	36.736	30.341	40.395	36.855	35.631
TL5 CCI	9.375	3.643	12.478	4.312	9.375	9.091	15.833	10.000	14.333
RIVPACS EXPECTED biotic index values									
TL1 BMWP	134.177	166.571	136.208	150.577	149.443	152.326	132.141	135.649	133.851
TL1 NTAXA	22.623	29.018	22.916	25.767	24.726	24.988	22.093	22.421	22.224
TL1 ASPT	5.892	5.707	5.909	5.821	6.027	6.078	5.938	6.012	5.983
TL2 WHPT Score (AbW,DistFam)	160.704	189.422	162.934	175.592	177.331	181.111	159.394	163.608	161.498
TL2 WHPT NTAXA (AbW,DistFam)	25.694	32.538	26.018	29.049	27.666	27.854	25.125	25.287	25.154
TL2 WHPT ASPT (AbW,DistFam)	6.251	5.8	6.264	6.059	6.429	6.514	6.331	6.461	6.411

Biotic Indices	SLU	WOO1-1	WOO1-2	WOO2	LAT1	LAT2	MIL1	MIL2	MIL3
TL5 AWIC(Sp) Murphy	6.638	6.596	6.633	6.617	6.689	6.713	6.637	6.68	6.664
TL5 WFD AWIC(Sp) Mcfarland	9.199	9.237	9.185	9.208	9.223	9.23	9.176	9.218	9.204
TL5 LIFE(Sp)	8.251	7.589	8.242	7.944	8.222	8.255	8.332	8.392	8.374
TL5 PSI(Sp)	71.604	52.114	71.458	62.697	71.827	73.381	74.143	76.041	75.375
TL5 SPEAR(Sp) %	45.943	41.596	46.403	44.208	46.754	46.82	47.003	47.665	47.506
TL5 CCI	9.242	11.736	9.212	10.418	10.554	10.928	8.948	9.477	9.205
OBSERVED/EXPECTED ratios									
TL1 BMWP	1.07	0.64	1.15	0.80	0.97	0.73	0.52	0.88	1.17
TL1 NTAXA	1.06	0.76	1.18	0.78	1.05	0.72	0.54	0.85	1.17
TL1 ASPT	1.02	0.84	0.98	1.04	0.93	1.01	0.97	1.05	1.01
TL2 WHPT Score (AbW,DistFam)	1.03	0.67	1.14	0.71	0.87	0.61	0.49	0.81	1.06
TL2 WHPT NTAXA (AbW,DistFam)	1.09	0.77	1.19	0.69	1.01	0.65	0.56	0.83	1.11
TL2 WHPT ASPT (AbW,DistFam)	0.95	0.87	0.95	1.02	0.85	0.95	0.88	0.98	0.96
TL5 AWIC(Sp) Murphy	1.01	1.06	1.04	1.10	0.75	0.89	0.68	0.99	1.00
TL5 WFD AWIC(Sp) Mcfarland	1.00	1.05	1.07	1.09	0.76	0.89	0.54	0.95	0.95
TL5 LIFE(Sp)	0.91	0.92	0.94	1.03	0.79	0.93	0.91	0.89	0.91
TL5 PSI(Sp)	0.72	0.66	0.85	1.25	0.39	0.95	0.84	0.82	0.85
TL5 SPEAR(Sp) %	0.64	0.72	0.89	0.79	0.79	0.65	0.86	0.77	0.75
TL5 CCI	1.01	0.31	1.35	0.41	0.89	0.83	1.77	1.06	1.56

4.5 Species with conservation designations

Species recorded with one or more conservation designations are presented in Table 4.13 below.

Table 4.13. Species found in the September 2017 RIVPACS samples with one or more current conservation designations.

Species	Designation	Source	Sites recorded
Enallagma cyathigerum Common Blue Damselfly, Common Bluet	Lower risk - least concern	The IUCN Red List of Threatened Species (2010)	MIL1, MIL3
	Least concern	Red listing based on 2001 IUCN guidelines. The Odonata Red Data List for Great Britain - 2008 (Caroline Daguet, Dr Graham French and Dr Pam Taylor - Eds)	
Calopteryx splendens (Harris, 1782) Banded Demoiselle Damselfly	Lower risk - least concern	The IUCN Red List of Threatened Species (2010)	LAT1, LAT2, WOO1-2
	Least concern	Red listing based on 2001 IUCN guidelines. The Odonata Red Data List for Great Britain - 2008 (Caroline Daguet, Dr Graham French and Dr Pam Taylor - Eds)	

Species	Designation	Source	Sites recorded
Anax imperator Leach, 1815 Blue Emperor, Emperor Dragonfly	Lower risk - least concern	The IUCN Red List of Threatened Species (2010)	LAT1
	Least concern	Red listing based on 2001 IUCN guidelines. The Odonata Red Data List for Great Britain - 2008 (Caroline Daguet, Dr Graham French and Dr Pam Taylor - Eds)	

5. RESULTS – REDD COUNTS

5.1 Dames Slough

A total of five sea trout redds and two resident trout redds were recorded within the Dames Slough area of interest. Summary details and spatial distribution of all features recorded are provided in Table 5.1 and Figure 5.1 respectively. Figure 5.2 shows an example of a sea trout redd recorded.

Table 5.1. Observations recorded during the redd count survey at Dames Slough (listed from upstream to downstream).

NGR	Feature	Size / Notes
SU2414005074	Debris dam	Passability unknown – 'leaky'
SU2453204967	Resident trout redd	0.3 m x 0.4 m x 0.1 m
SU2495504986	Resident trout redd	0.4 m x 0.4 m x 0.1 m
SU2526004939	Sea trout redd	0.7 m x 0.5 m x 0.2 m
SU2526604934	Sea trout redd	0.6 m x 0.4 m x 0.2 m
SU2528904907	Sea trout redd	0.9 m x 0.8 m x 0.3 m
SU2529404901	Sea trout redd	1.0 m x 0.7 m x 0.3 m
SU2530104890	Sea trout redd	0.8 m x 0.5 m x 0.3 m

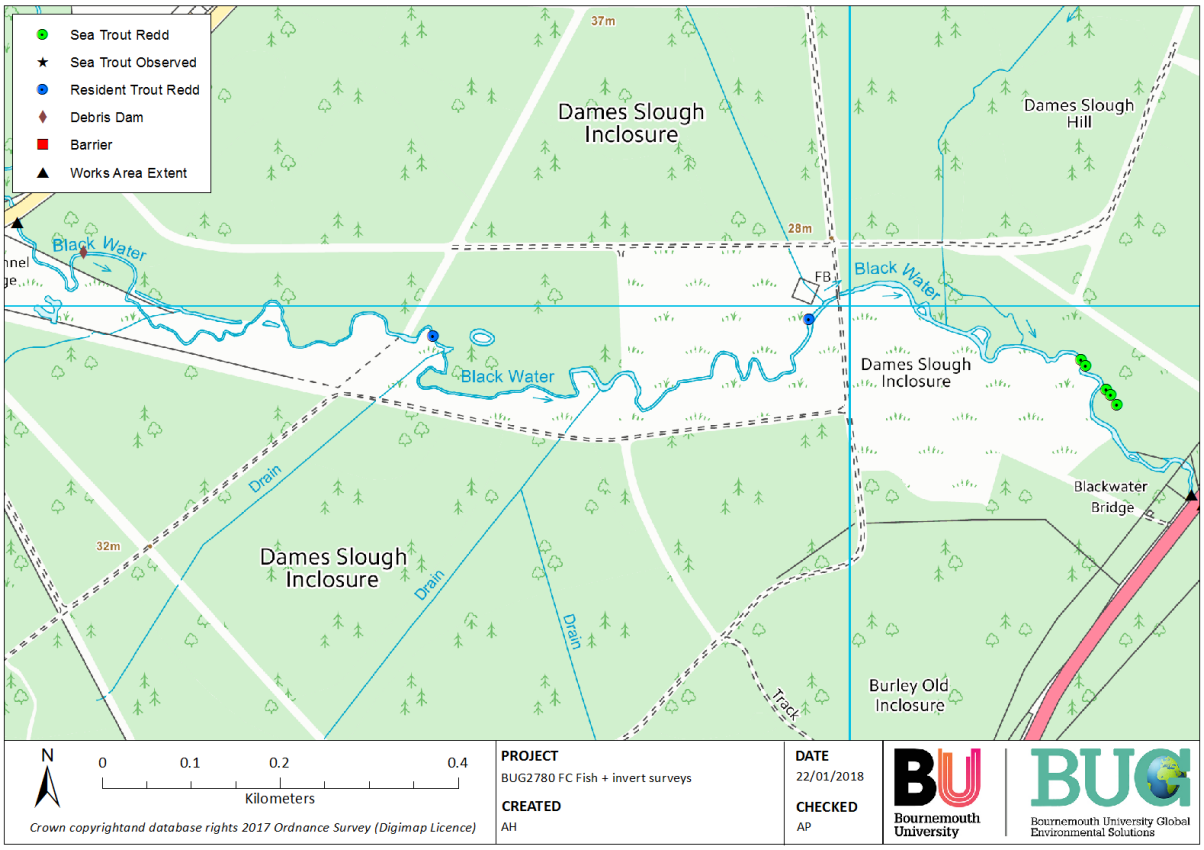

Figure 5.1. Observations recorded during the redd count survey at Dames Slough.

Figure 5.2. Example of a sea trout redd recorded during the survey at Dames Slough.

5.2 Latchmore Brook

A total of one sea trout redd and three resident trout redds were recorded within the Latchmore Brook area of interest. Summary details and spatial distribution of all features recorded are provided in Table 5.2 and Figure 5.3 respectively. Figure 5.4 shows an example of a sea trout redd recorded.

Table 5.2. Observations recorded during the redd count survey at Latchmore Brook (listed from upstream to downstream).

NGR	Feature	Size / Notes
SU2276415986	Barrier	Natural waterfall, impassable
SU2175014628	Debris dam	Probably passable under high flows
SU2171314431	Resident trout redd	0.4 m x 0.4 m x 0.1 m
SU2172114408	Resident trout redd	0.4 m x 0.4 m x 0.1 m
SU2135113930	Resident trout redd	0.3 m x 0.3 m x 0.1 m
SU2108113704	Sea trout redd	0.9 m x 0.9 m x 0.2 m
SU1965812769	Debris dam	Passable under high flows

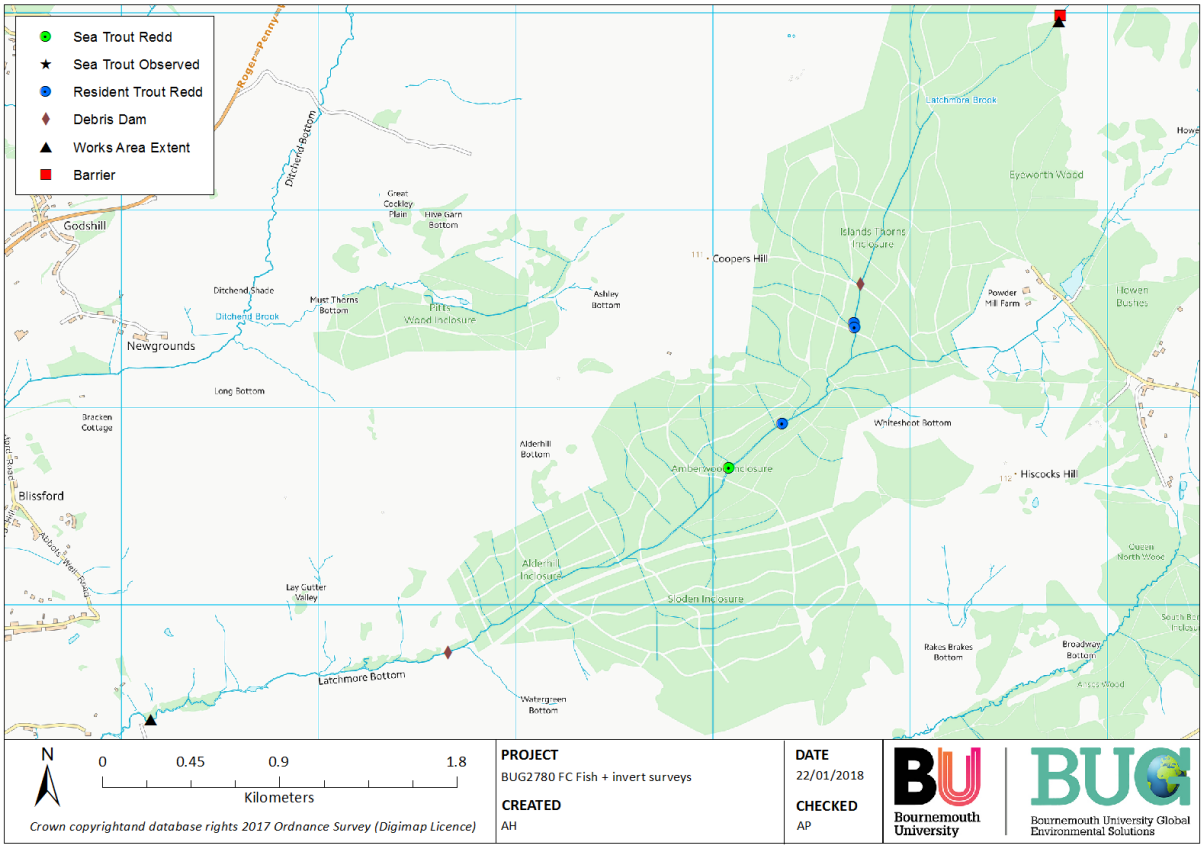

Figure 5.3. Observations recorded during the redd count survey at Latchmore Brook.

Figure 5.4. Example of a sea trout redd recorded during the survey at Latchmore Brook.

5.3 Linford Brook

A single sea trout redd and single brown trout redd were recorded within the Linford Brook area of interest. Summary details and spatial distribution of all features recorded are provided in Table 5.3 and Figure 5.5 respectively. Figure 5.6 shows an example of a sea trout redd recorded.

Table 5.3. Observations recorded during the redd count survey at Linford Brook (listed from upstream to downstream).

NGR	Feature	Size / Notes
SU1860807579	Sea trout redd	0.4 m x 0.5 m x 0.2 m
SU1834607448	Resident trout redd	0.3 m x 0.3 m x 0.1 m

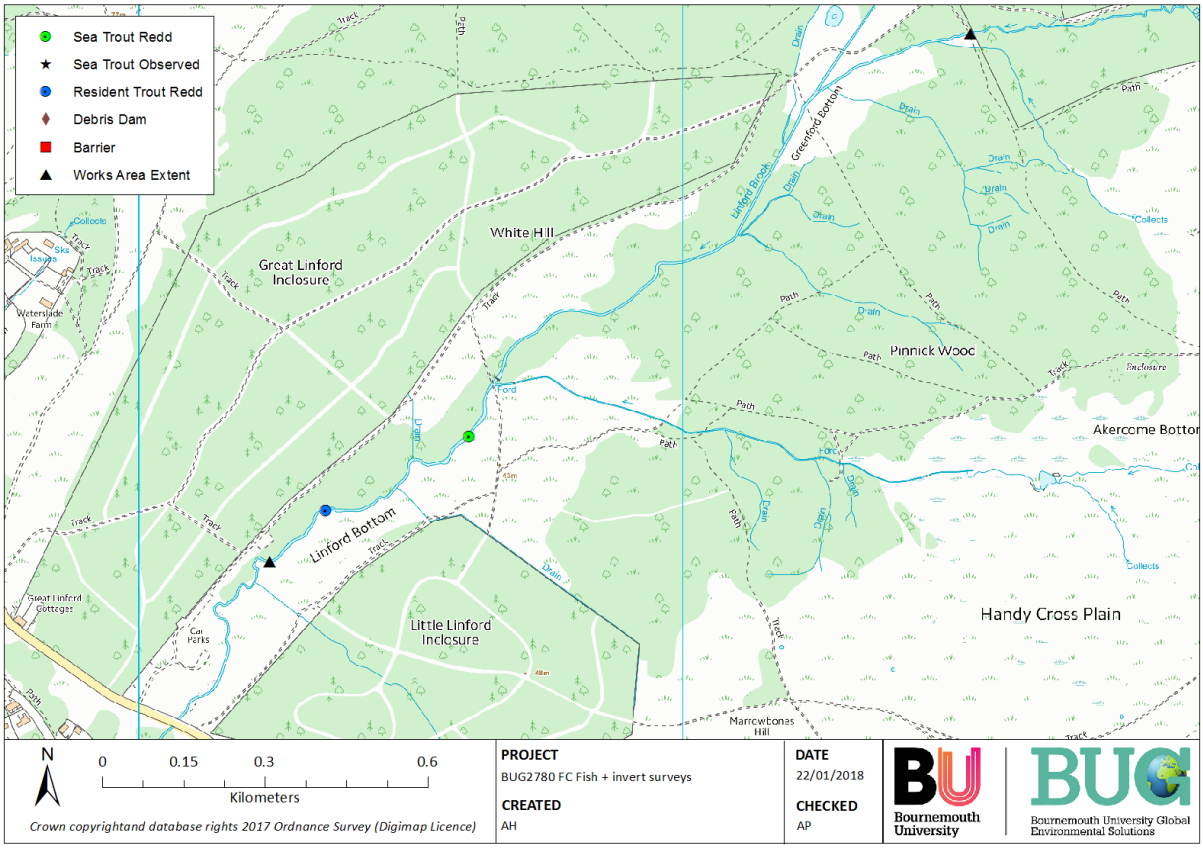

Figure 5.5. Observations recorded during the redd count survey at Linford Brook.

Figure 5.6. Example of a sea trout redd recorded during the survey at Linford Brook.

5.4 Millersford Brook

No evidence of trout spawning was observed within the area of interest at Millersford Brook.

5.5 Rhinefield

A total of 10 sea trout redds and three resident trout redds were recorded within the Rhinefield area of interest. Summary details and spatial distribution of all features recorded are provided in Table 5.4 and Figure 5.7 respectively. Figure 5.8 shows an example of a sea trout redd recorded.

Table 5.4. Observations recorded during the redd count survey at Rhinefield (listed from upstream to downstream).

NGR	Feature	Size / Notes
SU2564904736	Sea trout redd	0.8 m x 0.6 m x 0.3 m
SU2572604635	Sea trout redd	0.7 m x 0.7 m x 0.2 m
SU2574004626	Sea trout redd	0.8 m x 0.6 m x 0.3 m
SU2574204620	Sea trout redd	0.7 m x 0.5 m x 0.2 m
SU2575904605	Sea trout redd	0.7 m x 0.4 m x 0.2 m
SU2576704601	Sea trout redd	0.9 m x 0.5 m x 0.2 m
SU2577604604	Sea trout redd	0.8 m x 0.5 m x 0.2 m
SU2577904611	Sea trout redd	0.8 m x 0.6 m x 0.1 m
SU2591104571	Sea trout redd	1.2 m x 0.7 m x 0.2 m
SU2593204598	Sea trout redd	0.9 m x 0.6 m x 0.2 m
SU2593204598	Resident trout redd	0.4 m x 0.4 m x 0.1 m

NGR	Feature	Size / Notes
SU2595204605	Resident trout redd	0.3 m x 0.3 m x 0.1 m
SU2601804586	Resident trout redd	0.3 m x 0.3 m x 0.1 m

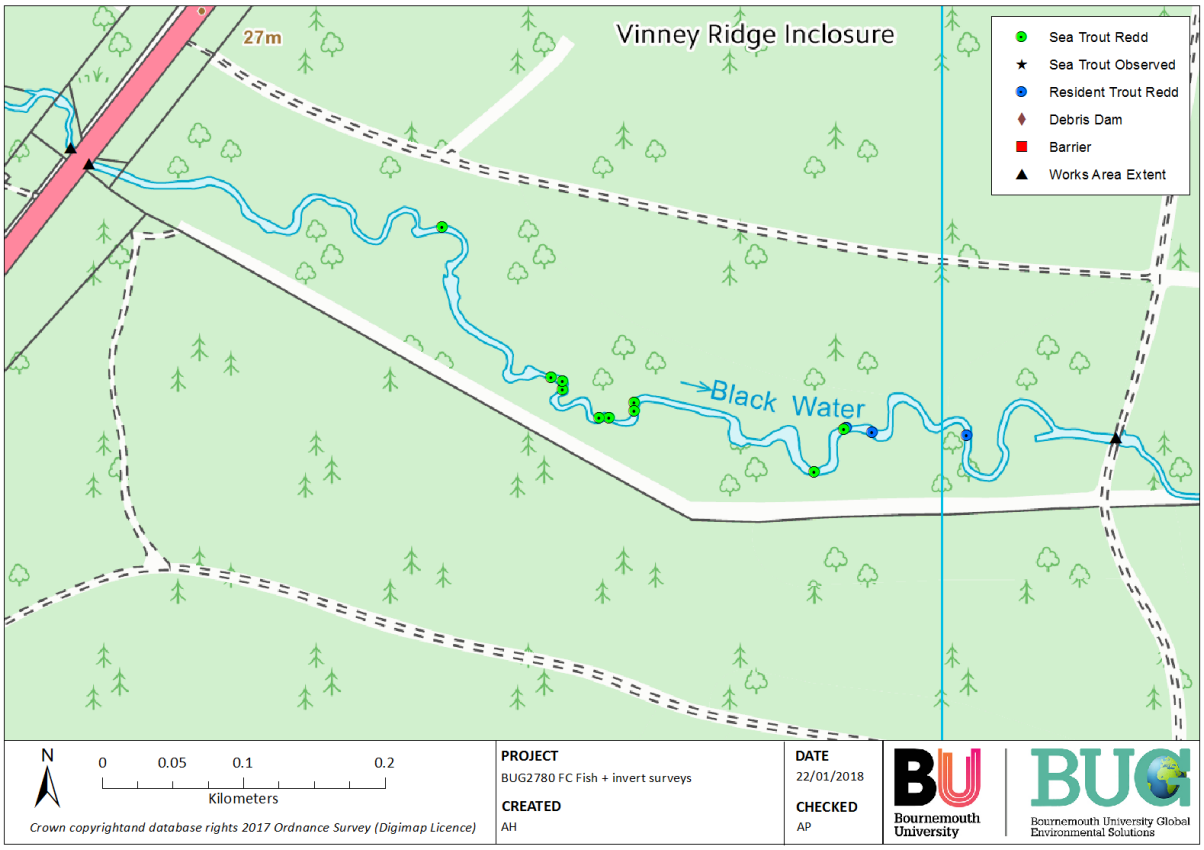

Figure 5.7. Observations recorded during the redd count survey at Rhinefield.

Figure 5.8. Example of a sea trout redd recorded during the survey at Rhinefield.

5.6 Slufters

A single resident trout redd was recorded within the Slufters area of interest (Table 5.5 and Figure 5.9).

Table 5.5. Observations recorded during the redd count survey at Slufters.

NGR	Feature	Size / Notes
SU2315209788	Resident trout redd	0.4 m x 0.3 m x 0.1 m

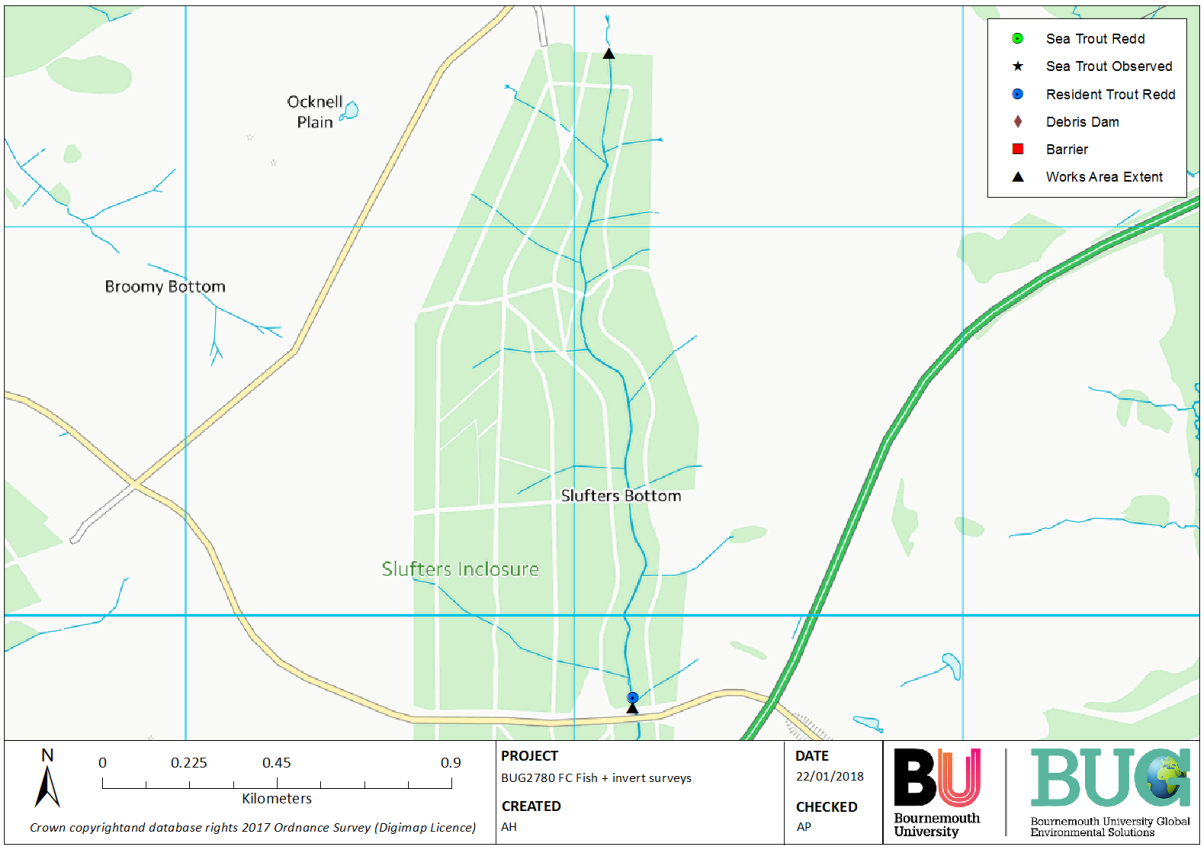

Figure 5.9. Observations recorded during the redd count survey at Slufters.

5.7 South Oakley

Two sea trout redds were recorded within the South Oakley area of interest. Summary details and spatial distribution of all features recorded are provided in Table 5.6 and Figure 5.10 respectively. Figure 5.11 shows a sea trout redd with a sea trout present.

Table 5.6. Observations recorded during the redd count survey at South Oakley (listed from upstream to downstream).

NGR	Feature	Size / Notes
SU2244705743	Barrier	Perched culvert, impassable
SU2264705649	Sea trout redd	0.6 m x 0.6 m x 0.2 m Sea trout (40 cm), plus two small resident trout present
SU2280605582	Sea trout redd	0.5 m x 0.5 m x 0.2 m

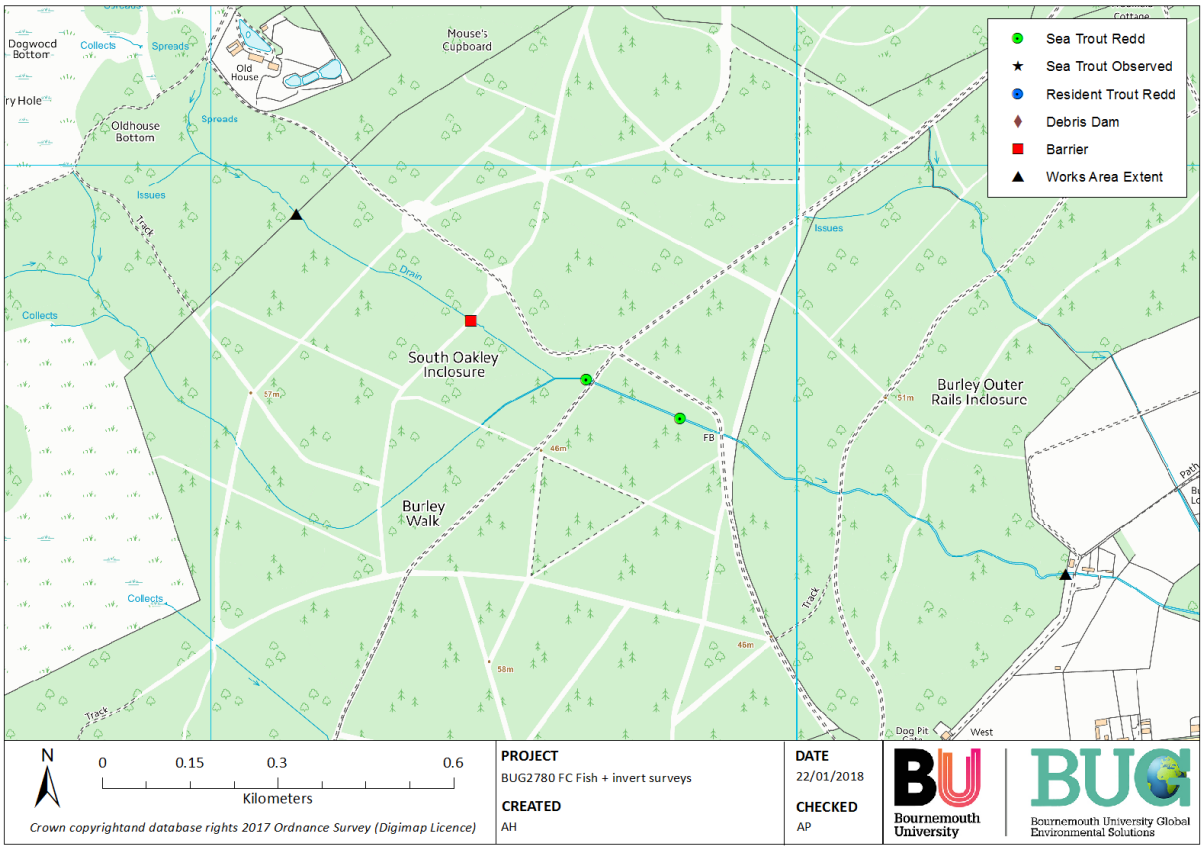

Figure 5.10. Observations recorded during the redd count survey at South Oakley.

Figure 5.11. Sea trout redd with sea trout present recorded during the survey at South Oakley.

5.8 Wootton Phase 1

A total of six sea trout redds and five resident trout redds were recorded within the Wootton Phase 1 area of interest. Summary details and spatial distribution of all features recorded are provided in Table 5.7 and Figure 5.12 respectively.

Table 5.7. Observations recorded during the redd count survey at Wootton Phase 1 (listed from upstream to downstream).

NGR	Feature	Size / Notes
SU2324000442	Sea trout redd	0.5 m x 0.3 m x 0.2 m
SU2331200390	Resident trout redd	0.3 m x 0.3 m x 0.1 m
SU2333100390	Resident trout redd	0.3 m x 0.3 m x 0.1 m
SU2335800389	Sea trout redd	0.5 m x 0.5 m x 0.2 m
SU2344300391	Resident trout redd	0.4 m x 0.3 m x 0.1 m
SU2372500347	Sea trout redd	1.2 m x 1.0 m x 0.2 m

NGR	Feature	Size / Notes
SU2380700330	Sea trout redd	1.2 m x 1.2 m x 0.2 m
SU2383300326	Resident trout redd	0.3 m x 0.3 m x 0.1 m
SU2384500318	Sea trout redd	1.2 m x 1.2 m x 0.2 m
SUSZ2448499855	Sea trout redd	1.0 m x 0.4 m x 0.2 m
SZ2453899816	Resident trout redd	0.4 m x 0.3 m x 0.2 m
SZ2500699682	Debris dam	Large (leaky) debris dam – passable under high flows

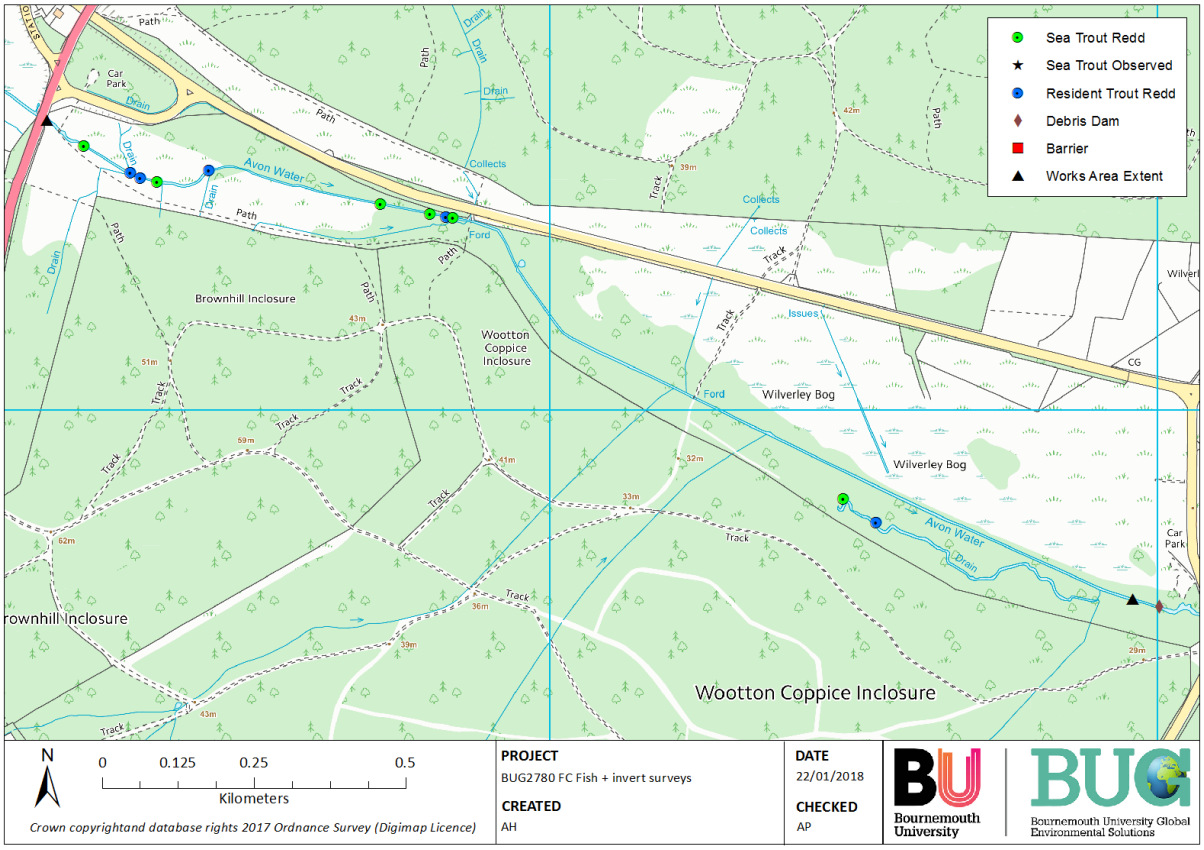

Figure 5.12. Observations recorded during the redd count survey at Wootton Phase 1.

5.9 Wootton Phase 2

A total of 15 sea trout redds and five resident trout redds were recorded within the Wootton Phase 2 area of interest. Summary details and spatial distribution of all features recorded are provided in Table 5.8 and Figure 5.13 respectively. Figure 5.14 shows an example of a sea trout redd recorded.

Table 5.8. Observations recorded during the redd count survey at Wootton Phase 2 (listed from upstream to downstream).

NGR	Feature	Size / Notes
SZ2511599672	Sea trout redd	0.8 m x 0.5 m x 0.2 m
SZ2511599672	Sea trout redd	0.8 m x 0.5 m x 0.2 m
SZ2513099669	Sea trout redd	0.7 m x 0.5 m x 0.2 m
SZ2548699591	Debris dam	Passability unknown – 'leaky'
SZ2550299574	Sea trout redd	1.0 m x 0.5 m x 0.2 m
SZ2567999506	Sea trout redd	0.6 m x 0.6 m x 0.2 m
SZ2575599476	Sea trout redd	0.5 m x 0.5 m x 0.2 m
SZ2581999442	Resident trout redd	0.3 m x 0.3 m x 0.2 m
SZ2582099434	Resident trout redd	0.4 m x 0.4 m x 0.1 m
SZ2586599416	Sea trout redd	0.8 m x 0.4 m x 0.3 m
SZ2586999417	Sea trout redd	1.0 m x 0.5 m x 0.3 m
SZ2588099394	Resident trout redd	0.3 m x 0.3 m x 0.1 m
SZ2589399393	Sea trout redd	1.0 m x 0.5 m x 0.2 m
SZ2589199381	Sea trout redd	1.2 m x 0.8 m x 0.2 m
SZ2593099351	Sea trout redd	1.0 m x 0.5 m x 0.3 m
SZ2596299322	Sea trout redd	0.8 m x 0.5 m x 0.2 m
SZ2597399295	Resident trout redd	0.5 m x 0.4 m x 0.1 m
SZ2599399281	Resident trout redd	0.4 m x 0.4 m x 0.2 m
SZ2624299033	Debris dam	Fallen tree diverting majority of flow into new channel
SZ2636698842	Sea trout redd	0.5 m x 0.5 m x 0.3 m
SZ2637998833	Sea trout redd	0.9 m x 0.6 m x 0.2 m
SZ2639398813	Sea trout redd	1.0 m x 0.5 m x 0.2 m

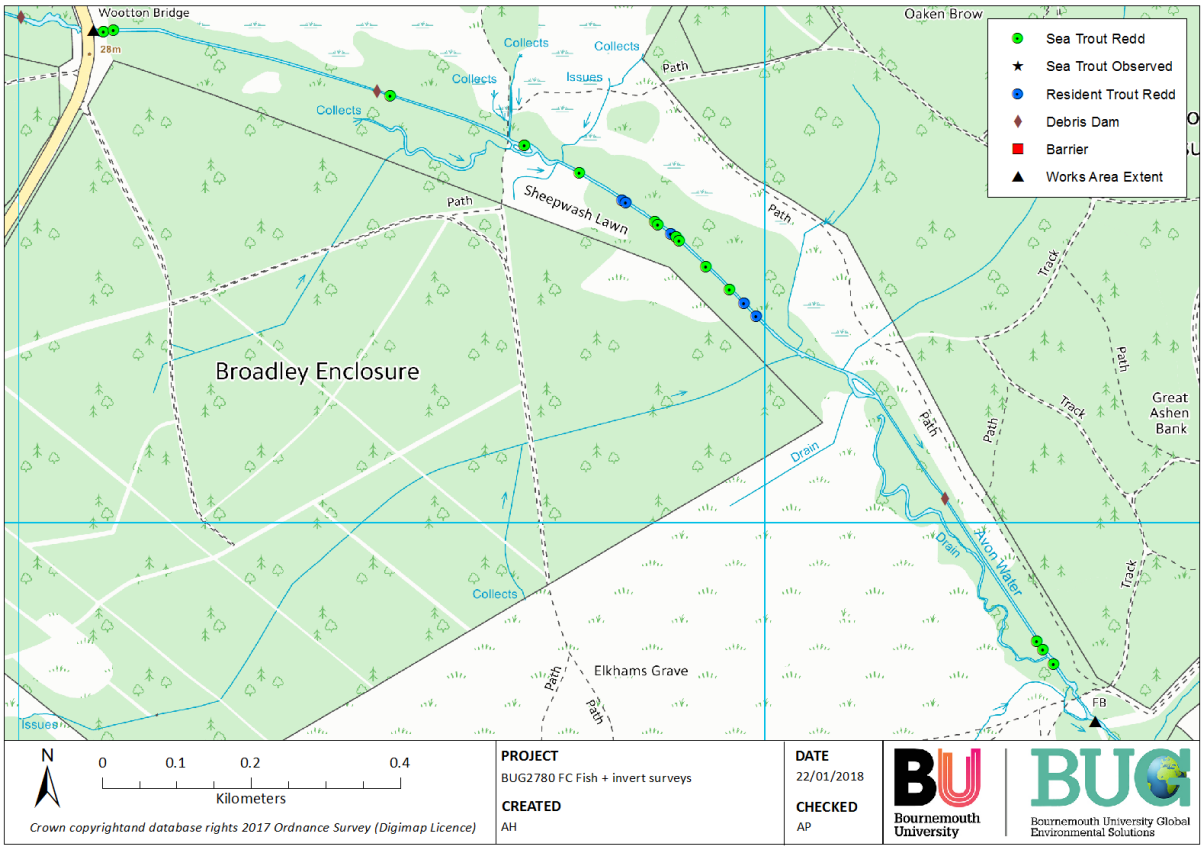

Figure 5.13. Observations recorded during the redd count survey at Wootton Phase 2.

Figure 5.14. Example of two sea trout redds recorded during the survey at Wootton Phase 2.

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Figure A1.1. Upstream stop net and typical habitat at Dames Slough Site 1.

Figure A1.2. Typical habitat at Dames Slough Site 1 .

Figure A1.3. Typical habitat at Dames Slough Site 1.

Figure A1.4. Typical habitat at Dames Slough Site 1.

Figure A1.5. Downstream stop net and typical habitat at Dames Slough Site 1.

Figure A1.6. Brown trout captured at Dames Slough Site 1.

Figure A2.1. Upstream stop net and typical habitat at Dames Slough Site 2.

Figure A2.2. Typical habitat at Dames Slough Site 2.

Figure A2.3. Typical habitat at Dames Slough Site 2.

Figure A2.4. Typical habitat at Dames Slough Site 2.

Figure A2.5. Downstream stop net and typical habitat at Dames Slough Site 2.

Figure A2.6. Pike captured at Dames Slough Site 2.

Figure A3.1. Upstream stop net and typical habitat at Latchmore Brook Site 1.

Figure A3.2. Typical habitat at Latchmore Brook Site 1.

Figure A3.3. Typical habitat at Latchmore Brook Site 1.

Figure A3.4. Typical habitat at Latchmore Brook Site 1.

Figure A3.5. Downstream stop net and typical habitat at Latchmore Brook Site 1.

Figure A3.6. Chub captured at Latchmore Brook Site 1.

Figure A4.1. Upstream stop net and typical habitat at Latchmore Brook Site 2.

Figure A4.2. Typical habitat at Latchmore Brook Site 2.

Figure A4.3. Typical habitat at Latchmore Brook Site 2.

Figure A4.4. Typical habitat at Latchmore Brook Site 2.

Figure A4.5. Downstream stop net and typical habitat at Latchmore Brook Site 2.

Figure A4.6. Brown trout captured at Latchmore Brook Site 2.

Figure A5.1. Upstream stop net and typical habitat at Millersford Brook Site 1.

Figure A5.2. Typical habitat at Millersford Brook Site 1.

Figure A5.3. Typical habitat at Millersford Brook Site 1.

Figure A5.4. Typical habitat at Millersford Brook Site 1.

Figure A5.5. Typical habitat at Millersford Brook Site 1.

Figure A5.6. Downstream stop net and typical habitat at Millersford Brook Site 1.

Figure A6.1. Upstream stop net and typical habitat at Millersford Brook Site 2.

Figure A6.2. Typical habitat at Millersford Brook Site 2.

Figure A6.3. Typical habitat at Millersford Brook Site 2.

Figure A6.4. Typical habitat at Millersford Brook Site 2.

Figure A6.5. Downstream stop net and typical habitat at Millersford Brook Site 2.

Figure A6.6. Brown trout captured at Millersford Brook Site 2.

Figure A7.1. Upstream stop net and typical habitat at Millersford Brook Site 3.

Figure A7.2. Typical habitat at Millersford Brook Site 3.

Figure A7.3. Typical habitat at Millersford Brook Site 3.

Figure A7.4. Typical habitat at Millersford Brook Site 3.

Figure A7.5. Downstream stop net and typical habitat at Millersford Brook Site 3.

Figure A7.6. Brown trout captured at Millersford Brook Site 3.

Figure A8.1. Upstream stop net and typical habitat at Rhinefield.

Figure A8.2. Typical habitat at Rhinefield.

Figure A8.3. Typical habitat at Rhinefield.

Figure A8.4. Typical habitat at Rhinefield.

Figure A8.5. Typical habitat at Rhinefield.

Figure A8.6. Downstream stop net and typical habitat at Rhinefield.

Figure A9.1. Upstream stop net and typical habitat at Slufters.

Figure A9.2. Typical habitat at Slufters.

Figure A9.3. Typical habitat at Slufters.

Figure A9.4. Typical habitat at Slufters.

Figure A9.5. Typical habitat at Slufters.

Figure A9.6. Downstream stop net and typical habitat at Slufters.

Figure A10.1. Typical habitat at Wootton Phase 1 Site 1.

Figure A10.2. Typical habitat at Wootton Phase 1 Site 1.

Figure A10.3. Typical habitat at Wootton Phase 1 Site 1.

Figure A10.4. Typical habitat at Wootton Phase 1 Site 1.

Figure A10.5. Brown trout captured at Wootton Phase 1 Site 1.

Figure A10.6. Brown trout captured at Wootton Phase 1 Site 1.

Figure A11.1. Upstream stop net and typical habitat at Wootton Phase 1 Site 2.

Figure A11.2. Typical habitat at Wootton Phase 1 Site 2.

Figure A11.3. Typical habitat at Wootton Phase 1 Site 2.

Figure A11.4. Typical habitat at Wootton Phase 1 Site 2.

Figure A11.5. Downstream stop net and typical habitat at Wootton Phase 1 Site 2.

Figure A11.6. Brown trout captured at Wootton Phase 1 Site 2.

Figure A12.1. Upstream stop net and typical habitat at Wootton Phase 2.

Figure A12.2. Typical habitat at Wootton Phase 2.

Figure A12.3. Typical habitat at Wootton Phase 2.

Figure A12.4. Typical habitat at Wootton Phase 2.

Figure A12.5. Downstream stop net and typical habitat at Wootton Phase 2.

Figure A12.6. Brown trout captured at Wootton Phase 2.