



**Springs and Seepages of Wessex
Blackdown Hills Invertebrate Survey**

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Summary

Wessex Water approached Buglife with a view to the latter arranging and managing a five year survey of invertebrates associated with springs and seepages in the Wessex area. The surveyor was commissioned by Buglife to undertake the work. The Blackdown Hills were selected by Wessex Water as the area to cover in the first year and this report provides the results of survey work conducted there in August 2010. Survey methodology was discussed between Buglife and the surveyor and three-minute kick sampling was selected along with preservation of the bulk samples in the field and later processing by washing, sieving and sorting. Sweep netting for terrestrial invertebrates was also undertaken at each site for a period of twenty minutes and insects were selectively removed with a pooter (aspirator) and preserved in alcohol for later identification.

The results of the survey are presented in the report. Aquatic macro-invertebrates and terrestrial invertebrates were sampled from sixteen locations on seven sites. A total of 121 aquatic invertebrates and 291 terrestrial invertebrates were recorded and these include one possible Red Data Book and 14 Nationally Scarce species. The species of high nature conservation value and results in terms of biological water quality are discussed for each of the seven sites. Details of the ecology, distribution and status of the species of high nature conservation value are included in the report and the occurrence of these species throughout the sample sites is discussed. Location maps showing the sample sites are also enclosed. The site with the greatest number of species of high nature conservation value is Ashculm Turbarry with seven Nationally Scarce species recorded. The aquatic invertebrate samples were assessed using BMWP, ASPT and the number of scoring taxa. The majority of sites had 'good' or 'moderate' biological water quality with only two 'poor' sites (Blackdown & Sampford 2 & 3) and one 'very good' site (Deadman 11). The low BMWP scores at some sites no doubt largely reflects the acidic nature of most of the sites.

Reference is made to previous invertebrate surveys conducted in the Blackdown Hills and wider Wessex area which are known to the author. Various physical and chemical parameters were measured in the field and have been presented in a format that may assist in further analysis of the sites. Advance has also been made in obtaining details on other spring and seepage sites in Wessex and general reference to these is also made.

1. Introduction

Wessex Water approached Buglife with a view to the latter arranging and managing a five year survey of invertebrates associated with springs and seepages in the Wessex area. The surveyor was commissioned by Buglife to undertake the work. The Blackdown Hills were selected by Wessex Water as the area to cover in the first year and this report provides the results of survey work conducted there in August 2010. Survey methodology was discussed between Buglife and the surveyor and three-minute kick sampling was selected along with preservation of the bulk samples in the field and later processing by washing, sieving and sorting. Sweep netting for terrestrial invertebrates was also undertaken at each site for a period of twenty minutes and insects were selectively removed with a pooter (aspirator). A total of 16 sites were sampled on seven sites.

Liaison with third parties has resulted in details being received of other sites that might be surveyed in future years.

2. Location

All the sites surveyed in 2010 were located within the Blackdown Hills on the Devon/Somerset border. Sample site grid references are given in Appendix 2 and sample site descriptions can be found in the SSSI citations for the sites on Natural England's website.

3. Methodology

3.1. Aquatic survey method

The samples were collected with a standard pond net (supplied by EFE Field Equipment, Totnes) and represent 3-minute kick samples taken in the channels. Ideally, the material was processed by washing and sieving in the field but where sufficient water was not available in the field to do this, the samples were preserved and this was conducted later. Each sample was initially washed using a coarse (1cm) sieve and 500-micron sieve first to remove any twigs, leaves, seeds, large stones, etc. The coarse material retained by the 1cm sieve was retained along with the 500-micron fraction. With the exception of Blackdown and Sampford Commons where the samples were sorted in the field, the samples were preserved using 10% formalin. The low species richness observed in the Blackdown samples and the difficulty of sorting black peaty samples in the field convinced the surveyor to preserve the samples and sort them more carefully at a later date. The preserved samples were later examined in the laboratory by placing small amounts of material into gridded petri-dishes and adding water. These petri-dishes were then examined carefully under a stereomicroscope. Each light fraction typically used 40-50 petri-dishes this way with the smaller elutriated fractions using 10-20 petri-dishes. The coarse fraction (>1cm in size) was examined in a white tray for large invertebrates such as large cased caddis and large aquatic snails. Aquatic invertebrates were removed from the fractions and counted at the same time. For particularly abundant taxa, sub-sampling was used to estimate the total number of specimens (i.e. individuals were counted from 20-25% of the dishes and multiplied up).

Originally, use of a small surber sampler was considered for sampling but the low flows, very shallow water and lack of channels at most of the sites made the use of these impractical. Small surber samplers were used, for example, by Kutty (2006) but in watercourses with more channelised flow, more head of water and greater flow. Drift nets and the collection and examination of chironomid exuviae were also considered but given time constraints imposed these were methods were rejected.

3.2. Recording of environmental variables

Grid references were obtained using a Garmin eTrex global positioning system. Conductivity, pH, total dissolved solids and water temperature were measured using a Hannah HI98130 portable meter whilst turbidity was measured using a turbidity tube. Other variables were

estimated or measured with a meter rule.

3.3. *Terrestrial survey method*

Sweep netting for terrestrial invertebrates was also undertaken at each site over bare ground, through low vegetation and through fringing scrub or low tree branches for a period of twenty minutes and insects were selectively removed with a pooter (aspirator). A 40cm diameter net supplied by Marris House Nets, Bournemouth and mounted on a metre long angling pole was used. Material was placed in alcohol in the evening for later examination.

3.4. *Identification*

All aquatic macroinvertebrates have, in general, been identified to species level. For immature specimens and females not separable to species, identification has been left at the appropriate level.

As usual, nematodes, oligochaetes, ostracods and copepods have not been identified further. Water beetle larvae and Diptera larvae have been identified to the most appropriate level.

Frequent taxonomic groups not identified in the sweep net samples included Opiliones (harvestmen), Araneae (spiders), Neuroptera (lacewings), Auchenorrhyncha, Miridae, Lygaeidae, Scirtidae (adults), Ceratopogonidae, Culicidae, Mycetophiloidea, Psychodidae, Phoridae, selected Pipunculidae (females of most genera, *Chalarus* spp, *Eudorylas* spp) Agromyzidae, Drosophilidae, Sphaeroceridae, Calliphoridae, Anthomyiidae, Muscidae and Symphyta (sawflies). Terrestrial Coleoptera were relatively poorly represented in the sweep net samples. These were left because time was not available to identify everything and some taxonomic groups had to be rejected. Some of these groups are taxonomically difficult and the time taken to identify them could not be justified. Of the groups above, perhaps the Psychodidae are the most useful because they have aquatic larvae and they are relatively straightforward to identify (although they are rarely included in surveys). All unidentified material will be retained indefinitely by the surveyor.

3.5. *Assessment*

Biological Monitoring Working Party (BMWP) scores and Average Score per Taxon (ASPT) have been calculated for the samples and are given in Appendices 1-3. The BMWP is a biotic index that uses aquatic macroinvertebrates to determine water quality of running waters in relation to organic pollution. It works on the principle that macroinvertebrates are sensitive to water quality with the most pollution sensitive scoring highly (up to 10) with the most pollution tolerant scoring low scores (zero, in the worst case). Most organisms fall somewhere on a scale between the two extremes. The values for each taxon are added together to give an overall total for the sample site. The total scores are banded into five categories reflecting poor, moderate, good, very good and excellent water quality (Table 1). The BMWP score alone is insufficient due to the variability of the scores in relation to habitat diversity. By using a combination of BMWP and the Average Score per Taxon (obtained by dividing the BMWP score by the number of taxa used to obtain that score) the influence of habitat diversity is reduced. Armitage et al (1983) recommended the use of ASPT since its value is less sensitive to sampling effort and seasonal change than is the BMWP score.

The rarity of the species recorded has been checked against the Red Data Book and Nationally Scarce statuses given to rare and uncommon invertebrates by the Joint Nature Conservation Committee. The JNCC statuses are taken from the latest national reviews to different insect orders and these are also given on the computer database software RECORDER. Red Data Book species are confined to between 1 and 15 10km squares in Britain whilst Nationally scarce species are those confined to between sixteen and one hundred 10km squares.

4. **Selection of survey sites**

The selection of the survey sites was done by contacting relevant local organisations in

particular Natural England, Devon Wildlife Trust, Forestry Commission and Wessex Water. Several additional sites were recommended but for various reasons could not be surveyed. However, for completeness-sake and in case these are seen as suitable for survey in the future they are listed here:

- Otterhead. Similar seepages to Ruttersleigh and has had no agricultural input or other management for around 20 years. Owned by Wessex Water and open to the public. Wessex Water also have at least one another similar site in the Blackdown Hills (Ellen McDouall pers. comm.).
- Stockland Turbaries. Recommended by Siobhan Murphy (Natural England). These are not SSSIs but they support very good spring-line mires. They include Bucehayes Common (ST213050) and Quantock Common (ST223049). They are owned by Stockland Parish Council who gave permission to undertake a survey.

A large number of sites for sampling outwith the Blackdown Hills but within the Wessex area for surveying in further years have been recommended by Wessex Water/Buglife. Mendip District Council have provided a list of a large number of Country Wildlife Sites several of which include tufa deposits or springs and which could be used to select sites in subsequent years.

5. Previous data

5.1. Blackdown hills

Dr Martin Drake undertook terrestrial invertebrate survey work on the Blackdown Hills in 1988 on behalf of the Nature Conservancy Council and identified the material along with the present surveyor. The sites included four of the sites covered in the present survey namely Blackdown Common, Deadman SSSI, Ringdown Common and Southey and Gotleigh Moors SSSI. Details of the Diptera species of nature conservation interest recorded were published in Drake and Godfrey (1989). These include a number of the species recorded in the present survey including the crane fly *Tipula yerburyi* and the snail killing fly *Psacadina verbekei*.

David Boyce undertook an invertebrate survey of Ashculm Turbary in 2006 (Boyce, 2006). This surveyor recorded four Nationally Scarce water beetles and one Nationally Scarce spider on two visits in July and September. Boyce (ibid) mentions that marsh fritillary, pearl bordered fritillary and silver-studded blue formerly occurred at Ashculm Turbary. Two of the water beetles recorded by Boyce (ibid) namely *Laccobius atratus* and *Chaetarthria seminulum* were recorded on the present survey.

Ellen Douall (Wessex Water) sent a copy of a habitat survey report on non-operational land at Mount Fancy Farm (Ruttersleigh SSSI) undertaken in October 2008 (Douall 2008). The survey mentions the fact that butterflies are well recorded in the area, there are a relatively large number of old trees with plenty of standing and fallen dead wood which might support specialist invertebrates and that surveys for invertebrates other than the well recorded Lepidoptera should be undertaken but includes no further references to invertebrates.

5.2. Wider Wessex area

Somerset Environmental Records Centre (SERC) undertook a baseline survey of tufa springs in Somerset for the Environment Agency between 1997 and 2001. Eight sites were detailed for detailed survey including invertebrates. SERC have provided the surveyor with a copy of the baseline report which includes major tufa sites, grid references and site status. Aquatic invertebrate data is available but has yet to be followed up.

Freshwater biologists based at the Centre for Ecology and Hydrology (CEH) at Dorchester have undertaken a number of studies on small spring-fed streams in Dorset for example, Armitage and Blackburn (1998) and Kneebone et al (2002). Samples were collected by standard 3-minute kick-sampling followed by preservation in the field and were assessed using

RIVPACS software.

The current surveyor has undertaken aquatic macro-invertebrate surveys of small spring-fed streams in the Mendips in the Whatley-Frome area for a commercial client in order to assess the impacts of quarrying activities on streams and springs. Sampling involved 3-minute kick sampling and assessment using BMWP, ASPT and in more recent reports, Lotic Invertebrate Index for Flow Evaluation (LIFE). Several Red Data Book and Nationally Scarce invertebrates have been recorded including the caseless caddis *Rhyacophila septentrionalis* and *Tinodes unicolor*, the water beetle *Hydraena nigrita*, the riffle beetle *Riolus subviolaceus*, and the soldier flies *Oxycera morrisii* and *O. pardalina* which indicate a high nature conservation value of the sites for aquatic invertebrates.

Dr Martin Drake has also undertaken aquatic macro-invertebrate surveys on many of the same small, often spring-fed streams in the Mendip Hills for the same purpose his results are available in the report by Hafren Water (2005). The method was standard 3-minute kick sampling and the results were assessed using BMWP, ASPT, the Community Conservation Index (CCI) of Chadd and Extence (2004) and detrended correspondence analysis (DECORANA). Several Nationally Scarce species were recorded including those listed above and the white-clawed crayfish *Austropotamobius pallipes*. The baseline invertebrate survey of Mells River springs by Winder (1995) which is mentioned in Hafren Water (2005) is not available to the current surveyor.

6. Results and assessment

6.1. Species assessment

A total of 121 aquatic species and 291 terrestrial species were recorded and these are recorded in Appendices 1 & 3 respectively. Physical, chemical and other details including key vegetation of the sample locations are provided in Appendix 2. A total of one possible Red Data Book and 14 Nationally Scarce species were recorded. These are listed below and brief details of their ecology and status are provided.

Red Data Book K		
<i>Tabanus miki?</i>	Tabanidae	Diptera

Nationally Scarce		
<i>Agabus melanarius</i>	Dytiscidae	Coleoptera
<i>Chaetarthria seminulum</i>	Hydrophilidae	Coleoptera
<i>Laccobius atratus</i>	Hydrophilidae	Coleoptera
<i>Tipula yerburyi</i>	Tipulidae	Diptera
<i>Dixa maculata</i>	Dixidae	Diptera
<i>Ptychoptera longicauda</i>	Ptychopteridae	Diptera
<i>Sphegina verecunda</i>	Syrphidae	Diptera
<i>Xylota florum</i>	Syrphidae	Diptera
<i>Sapromyza basalis</i>	Lauxaniidae	Diptera
<i>Sapromyza zetterstedti</i>	Lauxaniidae	Diptera
<i>Psacadina verbekei</i>	Sciomyzidae	Diptera
<i>Tetanocera punctifrons</i>	Sciomyzidae	Diptera
<i>Elachiptera pubescens</i>	Chloropidae	Diptera

<i>Meonura minutissima</i>	Carnidae	Diptera
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Further details of the ecology, status and distribution of these species are provided in Appendix 4.

The occurrence of the Red Data Book and Nationally Scarce species throughout the sample sites are summarised in Table 3. The differing numbers of RDB and NS species per site may partly be explained however by the fact that the sites had varying survey effort and this should be taken into account when using Table 3.

Some general comments about taxa may be worthwhile. The general lack of aquatic (and terrestrial) molluscs almost certainly reflects acidic nature of most of the sites. The keeled skimmer *Orthetrum caerulescens* was frequent on many of the sites and was perhaps the most frequent dragonfly recorded. Most of the specimens of the tachinid genus *Exorista* from the survey need to be re-examined but *Exorista fasciata* appears to be the species present in most (all?) cases.

6.2. Biological water quality

Table 1 shows how BMWP scores relate to biological water quality whilst Table 4 summarises the BMWP, ASPT and number of scoring taxa for each of the samples. The low BMWP scores at some sites no doubt largely reflects the acidic nature of most of the sites and the fact that acid sites generally have low species richness and low abundance amongst aquatic invertebrates. The results for number of scoring taxa and ASPT largely repeat these trends. A trend appears to be present whereby the centres of basin mires are poorer in aquatic macro-invertebrates compared with the flushed sides of the basins even if these are wooded. The majority of sites had 'good' or 'moderate' biological water quality with only two 'poor' sites (Blackdown & Sampford 2 & 3) and one 'very good' site (Deadman 11).

6.3. Ashculm Turbary

Ashculm Turbary is important for its wet heathland communities. The western boundary coincides with the springline occurring at the junction of the Upper Greensand with the overlying Clay-with-flints. The SSSI citation on Natural England's website provides a much more complete physical and botanical description of the site. An invertebrate survey of this site concentrating on Coleoptera was undertaken in 2006 by David Boyce (Boyce, 2006).

Ashculm Turbary was the best site for Nationally Scarce species on the survey with seven species recorded. These are briefly discussed. The diving beetle *Agabus melanarius* occurs in pools in part shade, often those that are spring-fed and on hillsides at the edge of woodland. As well as Ashculm Turbary it was also recorded from three other sites and consequently it would appear to be relatively frequent in suitable areas within the Blackdown Hills. The minute water beetle *Chaetarthria seminulum* is usually found in shallow water with sand, mud or moss in cliff-face seepages, on the muddy banks of streams and in moss carpets in basin mires and valley mires. It was only recorded on the present survey from Ashculm Turbary. The related *Laccobius atratus* is typically associated with hillside flushes, watershed and valley mires. It was recorded on the survey from Ashculm Turbary, as well as two other main sites.

The crane fly *Tipula yerburyi* is a southern species which appears to be most frequent in southwest England where it typically occurs in wet, usually acid woods. It was recorded from acid woodland within Ashculm Turbary on the survey. The hoverfly, *Xylota florum*, normally occurs in woodland by water or in moist valleys and was recorded from Ashculm Turbary along with the Nationally Scarce lauxaniid fly *Sapromyza basalis* which appears to be associated with damp broadleaved woodland. The snail-killing fly *Tetanocera punctifrons* uses a range of wetlands including fens, damp heaths, mires and riversides where its larvae parasitise aquatic snails.

The empid fly *Drapetis arcuata* may be worth mentioning because it formerly had Notable status but was downgraded by Falk and Crossley (2005). This species was recorded in the woodland flushes at Ashculm Turbary. A number of additional uncommon species were also recorded such as the distinctive hoverfly *Arctophila superabiens*.

Larvae of the biting midge family *Atrichopogon* in low numbers and these closely resemble the illustrations for *Atrichopogon alveolatus* in Nielsen (1951). However, this species only appears to have been described as larvae and is still only known from Denmark (Soós and Papp 1988). Ideally, larvae of this species need to be reared and the adults compared with the adults of other species. It will probably be the case that *alveolatus* is a synonym of a species already on the British list.

The higher BMWP score at Ashculm Turbary sample site 12 was surprisingly since this was within the woodland whilst the lower scoring Ashculm Turbary 13 was taken from the open basin mire and might have been expected to have produced better a BMWP score because of its greater access to sunlight, relatively large area of shallow water, etc. Site 12 is outside the area grazed by the Exmoor ponies whilst site 13 is grazed by these, but whether this is a deciding factor in influencing the occurrence of invertebrates is unclear. Using Table 2, site 12 has good biological water quality whilst site 13 has moderate biological water quality.

6.4. *Blackdown and Sampford Commons*

Blackdown and Sampford Commons have the best and most extensive surviving examples of heathland, carr woodland and marshy grassland habitats that have developed on acidic soils overlying the Greensand and Keuper Marls within the Blackdown Hills. The SSSI citation on Natural England's website provides a much more complete physical and botanical description of the site. Drake and Godfrey (1989) provide records of scarce Diptera recorded from this site.

Two Nationally Scarce species were recorded from Blackdown and Sampford Commons (Table 3).

The water beetle *Laccobius atratus* is typically associated with hillside flushes, watershed and valley mires. It was recorded on the survey from all three sample locations on Blackdown and Sampford Commons and also from two other main sites. The chloropid fly *Elachiptera pubescens* is often regarded as essentially a coastal species but it also occurs on damp heathland, gravel pits and in marshes.

The water beetle *Helochares lividus* may be worth mentioning because it formerly had Notable status but was downgraded by Foster (2004). This species was found at Blackdown sample site 3.

Blackdown & Sampford 1 represents hillside flushes which clearly had more species than the spring-fed mire at Blackdown & Sampford 2 or the eutrophicated Blackdown & Sampford 3 (the reasons for the nutrient enrichment were unclear but the vegetation and algae clearly indicated this). Blackdown & Sampford sample 1 achieved 'moderate' biological water quality according to the conversion table (Table 2) with samples 2 & 3 only achieving 'poor' biological water quality. The low BMWP scores may reflect the ineffectiveness of trying to sort invertebrates from these sites in the field but it was also the difficulty of observing invertebrates against the dark peaty substrate in the sorting tray and the lack of clean water with which to sort the samples also presented problems. The low species richness of sites 2 & 3 almost certainly also reflects the acid nature of these sample sites.

6.5. *Deadman*

Deadman is one of the best remaining examples of mixed valley mire in Somerset. It contains a rich mosaic of wet heath, bog pools and birch/willow carr grading into acid marshy grassland. Ground water issues from numerous springs within the Greensand producing a locally raised water table and bog communities have developed at these points. The SSSI citation on Natural England's website provides a much more complete physical and botanical

description of the site. Drake and Godfrey (1989) provide records of scarce Diptera recorded from this site.

The occurrence of the Red Data Book and Nationally Scarce species throughout the sample sites are summarised in Table 3. Deadman is second best site for rare and uncommon species with five Nationally Scarce species. These are briefly discussed below.

The diving beetle *Agabus melanarius* occurs in pools in part shade, often those that are spring-fed and on hillsides at the edge of woodland. It was recorded on the survey from Ashculm Turbary as well as three other sites and consequently it would appear to be relatively frequent in suitable areas within the Blackdown Hills. The related *Laccobius atratus* is typically associated with hillside flushes, watershed and valley mires. It was recorded on the survey from all three sample locations on Blackdown and Sampford Commons and from two other sites.

The snail-killing fly *Psacadina verbekei* uses a range of wetlands including fens, damp heaths, mires and riversides where its larvae parasitise aquatic snails. The chloropid *Elachiptera pubescens* is often regarded as essentially a coastal species but it also occurs on damp heathland, gravel pits and in marshes. The habitat requirements of the minute carniid *Meonura minutissima* are unclear but include chalk grassland, moorland and woodland.

A snail belonging to the family Vertiginidae was recorded from the site but it was in poor condition and could not be identified possibly not just because of the pH of the sample site but because the formaldehyde preservative may have dissolved the periostracum (outer shell layer) and other parts of the shell. Whorl-snails belonging to the genus *Vertigo* are often of high nature conservation value and they include several UK Biodiversity Action Plan (BAP) species.

Larvae of the biting midge family *Atrichopogon* were recorded from Deadman in low numbers and these closely resemble the illustrations for *Atrichopogon alveolatus* and *A. polydactylus* in Nielsen (1951). However, these species only appear to have been described as larvae and are still only known from Denmark (Soós and Papp 1988). As mentioned above, the larvae need to be reared and the adults compared with adults of other species and it will probably be the case that both *alveolatus* and *polydactylus* are synonyms of species already on the British list.

Large differences in BMWP are clear between the two Deadman samples even those these were relatively close together; the first sample (sample 10) was in a small basin mire where several streamlets had coalesced whilst the second sample (sample 11) was on the edge of scrub higher up the slope. The reasons for the wide differences in the BMWP scores are not clear but flow and dissolved oxygen should have been greater at the latter and these may be explanatory factors. Using Table 2, sample site 10 achieves moderate biological water quality whilst sample site 11 achieves 'very good' biological water quality and was the only sample to do so on the survey. Deadman sample 11 had the greatest number of scoring taxa (20spp) recorded on the survey and the highest ASPT score (6.1).

6.6. Hense Moor

Hense Moor includes some of the best remaining examples of lowland mixed valley bog in Devon. Around the valley, groundwater emerges from the Greensand and several streams arise in and flow through the site. The SSSI citation on Natural England's website provides a much more complete physical and botanical description of the site.

Two Nationally Scarce species were recorded from Hense Moor (Table 3). The diving beetle *Agabus melanarius* occurs in pools in part shade, often those that are spring-fed and on hillsides at the edge of woodland. It was recorded on the survey from Ashculm Turbary, Deadman, Hense Moor and Ringdown and consequently would appear to be relatively frequent in suitable areas within the Blackdown Hills. The meniscus midge *Dixa maculata* is

mainly recorded from northern and western Britain and the larvae live in shallow, stony streams usually in hilly areas. It was recorded on the survey as larvae and adults from Hense Moor and as larvae from Ruttersleigh.

Hense Moor sample 6 was taken where springs arise at the head of a small wooded valley and has a higher BMWP score compared with Hense Moor samples 4 & 5 which were grazed. Using Table 2, the sample sites achieved moderate to good biological water quality. Hense Moor 5 was located lower down the slope and near a stream; the reason for the lower BMWP score, lower number of scoring taxa and lower ASPT score may reflect the distance from springheads (with flow, higher dissolved oxygen, etc) as well as greater shade. Hense Moor 6 had the second highest number of scoring taxa recorded on the survey (19).

6.7. Ringdown

This site is located on a valley side in the Blackdown Hills where outcrops of Cretaceous Upper Greensand and underlying Triassic Keuper marls occur. A seepage line at the base of the Upper Greensand ensures that the area is always very wet and the Greensand aquifer results in the groundwater being highly acidic. The SSSI citation on Natural England's website provides a much more complete physical and botanical description of the site. Drake and Godfrey (1989) provide records of scarce Diptera recorded from this site.

The occurrence of the Red Data Book and Nationally Scarce species throughout the sample sites are summarised in Table 3. Ringdown is third best site for rare and uncommon species with four Nationally Scarce species.

Possible larvae of the Red Data Book horse-fly *Tabanus miki* were recorded from Ringdown. Identification of the larvae needs to be double-checked and may still be regarded as provisional unless adults can be recorded from the site. The habitat would appear to be ideal for tabanids with blocks of woodland interspersed with flushed marshy ground and a herd of cattle present (which could be a source of bloodmeals). This horsefly has a patchy distribution throughout southern England and the Midlands and appears to be associated with woodlands. Further surveys possibly involving Malaise traps would be required to confirm the presence of this species on the site.

The diving beetle *Agabus melanarius* occurs in pools in part shade, often those that are spring-fed and on hillsides at the edge of woodland. It was recorded on the survey from Ashculm Turbary, Deadman, Hense Moor and Ringdown and consequently would appear to be relatively frequent in suitable areas within the Blackdown Hills.

Ptychoptera longicauda is a relative of craneflies and has a clumped distribution in southern England. The habitat of this species is woodland streams with silted areas and at least half the recorded sites are thought to be calcareous. It was only recorded on the survey from Ringdown. The chloropid *Elachiptera pubescens* is often regarded as essentially a coastal species but it also occurs on damp heathland, gravel pits and in marshes.

There are only three British records of the scatopsid *Rhexosa subnitens* according to Freeman and Lane (1985) and consequently the record from Ringdown in this report is important. Members of this family have not been given rarity statuses because their ecology and status is poorly known and they are almost certainly under-recorded.

The woodland flushes at Ringdown 14 produced a better BMWP score compared with the small open mire at Ringdown 15. The former is assessed as having good biological water quality whilst the latter has moderate biological water quality. This result is somewhat surprising and similar to the situation at Ashculm Turbary.

6.8. Ruttersleigh

This site comprises a mosaic of broadleaved woodland, scrub, bracken, mires and unimproved grassland. The site is located on the north facing slope of the Blackdown Hills and there are a

number of springs and seepage lines within the site associated with the Jurassic shales/Cretaceous Upper Greensand boundary and many streams arise within it, all of which drain to the north. The SSSI citation on Natural England's website provides a much more complete physical and botanical description of the site. Douall (2008) provides a habitat survey report on non-operational land at Mount Fancy Farm (Ruttersleigh SSSI).

Two Nationally Scarce species were recorded from Ruttersleigh (Table 3). The meniscus midge *Dixa maculata* is mainly recorded from northern and western Britain and the larvae live in shallow, stony streams usually in hilly areas. It was recorded on the survey as larvae from Ruttersleigh and as larvae and adults from Hense Moor. The Nationally Scarce lauxaniid fly *Sapromyza zetterstedti* which may be associated with conifers was recorded.

A number of additional uncommon species were recorded such as the snail-killing fly *Pteromicra angustipennis*.

Larvae of the biting midge family *Atrichopogon* were recorded in low numbers as was the case at a number of other sites and these closely resemble the illustrations for *Atrichopogon alveolatus* in Nielsen (1951). The significance of this species was mentioned above for Ashculm Turbary.

Ruttersleigh 7 was the springbourne stream, Ruttersleigh 8 was a bare seepage comprising large amounts peat and more recent organic matter (leaves, twigs) and Ruttersleigh 9 was a poached seepage with enhanced nutrient input on a gentle hillside. Of these the springfed stream has the highest BMWP score (89), followed by the bare seepage at site 8 (64) and then the grazed and nutrient enriched seepage (32). The first two sample sites have good biological water quality whilst the latter has moderate biological water quality using Table 2. Ruttersleigh 7 had the second highest ASPT score (5.9) recorded on the survey.

6.9. *Southey and Gotleigh Moors*

Southey and Gotleigh Moors is one of the richest mosaics of valley mire, acid-marsh grassland and alder-birch carr to be found in the Blackdown Hills. The site contains a large and diverse, moderately acid, flush and bog complex. The SSSI citation on Natural England's website provides a much more complete physical and botanical description of the site. Drake and Godfrey (1989) provide records of scarce Diptera recorded from this site.

One Nationally Scarce species were recorded from Southey and Gotleigh Moors (Table 3). The slender hoverfly *Sphagina verecunda* is generally associated with woodland streams and damp woodlands and probably deserves to be downgraded from Nationally Scarce in the surveyor's opinion. It was recorded from Southey and Gotleigh Moors.

The woodland seepages at Southey and Gotleigh produced a relatively good BMWP score of 84 which corresponds to good biological water quality using Table 2.

6.10. *Future assessment*

BMWP was devised to assess organic pollution in streams and rivers and may therefore not be the most appropriate means of assessing the aquatic invertebrates in these samples. For the same reasons LIFE and RIVPACS may also not be appropriate. More appropriate methods may be species richness and species diversity along with multivariate statistical methods. These can be employed at a later stage, possibly in the fifth year of the project which will be solely used for further assessment and reporting. The recording of several physical and chemical variables at each site (Appendix 2) will facilitate the use of the multivariate methods. Terrestrial and aquatic invertebrates may also be assessed using the ISIS method which involves standardised invertebrate sampling but this may require some alteration in the survey methods (mainly involving the use of litter searching) and at least four sample sites per master site.

7. Conclusions

The results of an invertebrate survey on seepages and springs within the Blackdown Hills are presented. Aquatic macro-invertebrates and terrestrial invertebrates were sampled from sixteen locations on seven sites in August 2010. A total of 121 aquatic invertebrates and 291 terrestrial invertebrates were recorded and these include one possible Red Data Book and 14 Nationally Scarce species. Details of the ecology, distribution and status of the RDB and NS species are included in the report and the occurrence of these species throughout the sample sites is discussed. The site with the greatest number of species of high nature conservation importance is Ashculm Turbary with seven Nationally Scarce species recorded. The aquatic invertebrate samples were assessed using BMWP, ASPT and the number of scoring taxa. The majority of sites had 'good' or 'moderate' biological water quality with only two 'poor' sites (Blackdown & Sampford 2 & 3) and one 'very good' site (Deadman 11). The low BMWP scores at some sites no doubt largely reflects the acidic nature of most of the sites and the fact that acid sites generally have low species richness and low abundance amongst aquatic invertebrates.

Reference is made to previous invertebrate surveys conducted in the Blackdown Hills and wider Wessex area which are known to the author. Various physical and chemical parameters were measured in the field and have been presented in a format that may assist in further analysis of the sites.

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Table 1: Weather conditions on the survey dates

SURVEY DATA	WEATHER CONDITIONS
13th August 2010	Not noted but dry and suitable for sweep netting.
14th August 2010	Rain in morning: soil and vegetation wet but these gradually dried out during the morning. Sunny intervals.
15th August 2010	Cold, overcast and autumnal at start. Breeze in more open areas and high humidity at first site. In afternoon there was 100% cloud cover, high humidity and it was cool for the time of year. Warm and muggy later in afternoon.
16th August 2010	Hot and sunny

Table 2: Water quality banding of BMWP scores

DESCRIPTION	SCORE BAND
Poor	<25
Moderate	26-50
Good	51-100
Very Good	101-150
Excellent	>150

Table 3: Occurrence of Red Data Book and Nationally Scarce invertebrates throughout the sample sites

	Blackdown & Sampford	Hense Moor	Rutters-leigh	Deadman	Ashculm Turbary	Ringdown	Southey & Gotleigh
<i>Tabanus miki</i>						+	
<i>Agabus melanarius</i>		+		+	+	+	
<i>Chaetarthria seminulum</i>					+		
<i>Laccobius atratus</i>	+			+	+		
<i>Tipula yerburyi</i>					+		
<i>Ptychoptera longicauda</i>						+	
<i>Dixa maculata</i>		+	+				
<i>Sphegina verecunda</i>							+
<i>Xylota florum</i>					+		
<i>Sapromyza basalis</i>					+		
<i>Sapromyza zetterstedti</i>			+				
<i>Psacadina verbekei</i>				+			
<i>Tetanocera punctifrons</i>					+		
<i>Elachiptera pubescens</i>	+			+		+	
<i>Meonura minutissima</i>				+			
RDB & NS =	2	2	2	5	7	4	1

Table 4: BMWP, ASPT and number of taxa for the 3-minute samples taken in August 2010

	BMWP	NO.TAXA	ASPT	BIOLOGICAL WATER QUALITY BASED ON BMWP
Blackdown & Sampford 1	39	8	4.8	Moderate biological water quality
Blackdown & Sampford 2	16	4	4	Poor biological water quality
Blackdown & Sampford 3	23	6	3.8	Poor biological water quality
Hense Moor 4	69	15	4.6	Good biological water quality
Hense Moor 5	30	6	5	Moderate biological water quality
Hense Moor 6	82	19	4.3	Good biological water quality
Ruttersleig h 7	89	15	5.9	Good biological water quality
Ruttersleig h 8	64	11	5.8	Good biological water quality
Ruttersleig h 9	32	7	4.5	Moderate biological water quality
Deadman 10	34	8	4.2	Moderate biological water quality
Deadman 11	122	20	6.1	Very good biological water quality
Ashculm Turbary 12	69	13	5.3	Good biological water quality
Ashculm Turbary 13	37	8	4.6	Moderate biological water quality
Ringdown 14	68	13	5.2	Good biological water quality
Ringdown 15	31	8	3.8	Moderate biological water quality
Southey & Gotleigh Moor	84	15	5.6	Good biological water quality

Appendix 1: Aquatic invertebrates recorded from Blackdown Hills springs and seepages: August 2010

Red Data Book and Nationally Scarce species have been emboldened in the spreadsheet

**Appendix 2: Details of the aquatic invertebrate sample sites in the Blackdown Hills:
August 2010**

Appendix 3: Details of the terrestrial invertebrates recorded from Blackdown Hills springs and seepages: August 2010

Nationally Scarce species have been emboldened in the spreadsheet

Appendix 4: Details of the Red Data Book and Nationally Scarce species recorded in 2010

RED DATA BOOK K

Tabanus miki? Tabanidae Diptera

The main source of authentic specimens of this horse-fly is the New Forest but it has also been taken in recent decades from Norfolk, Northamptonshire, Surrey, Wiltshire and Glamorganshire according to Stubbs and Drake (2001). It appears to have a wide distribution in southern and midland woodlands. The early stages are unknown and larval development sites could include marshy areas by pools or streams, in damp rotting wood or leaf litter. The adults have been recorded in July and August.

NATIONALLY SCARCE

Agabus melanarius Dytiscidae Coleoptera

Recent published records are for South Devon, South Somerset, North Hampshire, East Sussex, West Kent, North Hampshire, Surrey, Worcestershire, Staffordshire, Cheshire, Derbyshire, South-west and North-east Yorkshire, Cumberland, Durham, South Northumberland, and Argyll. *A. melanarius* is a northern and central European species.

This species occurs in pools in part shade, often spring-fed and on the sides of hills at the edge of woodland. It has also been found in overgrown peat cutting areas on the edges of raised bogs. Typically *A. melanarius* is found between rotting leaves at the pool edges. It can tolerate the disturbance associated with deer-rutting and occasional vehicular use in ruts. This species has been intercepted in flight. Based on mark and recapture work, a German researcher concluded that, despite its ability to fly, *A. melanarius* was more static than the hydrophilid *Hydrobius fuscipes* occupying the same habitats in the Black Forest. The same researcher also linked its distribution with high levels of humates. The bimodal phenology of adults in the Black Forest study is similar to that of adult occurrences in Britain, indicating breeding in the spring by overwintered adults. In Wealden ponds, larvae occur in the summer.

Agabus melanarius has been recorded from 29 hectads in England, six in Scotland and one in Wales since 1950, the equivalent values since 1990 being 18, two and one respectively. Despite the occurrence of this species in many areas of relict woodland and forest in Europe, it is capable of colonising re-afforested areas wherever the natural drainage system has been left sufficiently intact to produce spring-fed pools and vehicle ruts.

Chaetarthria seminulum Hydrophilidae Coleoptera

There are recent records for South and North Somerset, East Sussex, East Kent, East Suffolk, East and West Norfolk, Northamptonshire, East and West Gloucester, Carmarthen, Pembroke, Cardigan, Merioneth, Anglesey, Leicestershire, Derbyshire, Mid-west Yorkshire, Westmorland, Cumberland, Kirkcudbrightshire, Dumfriesshire, Berwickshire, Midlothian, Stirlingshire, Forfar, East Inverness, West Sutherland, Shetlands Islands, Skomer, Islay, Raasay, Rum, Muck, and South Uist.

Chaetarthria seminulum lives in shallow water with sand, mud or moss. Thus it may be found in cliff-face seepages, on muddy banks of streams and in moss carpets in basin mires and in mesotrophic and base-rich valley mires. It is usually associated with exposed conditions in lowlands. It is often caught in pitfall traps in wet areas but is not easily taken with the pond net, being most easily detected when it floats to the surface after disturbance. Adults are regarded as nocturnal, staying in their burrows during the day. The bimodal occurrence of adults, with the main peak in April and May, indicates overwintering as adults which breed in the spring. The larvae have been found in July. Larvae do not appear to be able to swim, and are possibly non-aquatic, crawling at the water margins where they feed on small invertebrates.

Helochaeres lividus Hydrophilidae Coleoptera

Helochaeres lividus has been recorded from 174 hectads from 1990 onwards and it was found in five samples of the British Countryside Survey in 1990. These data indicate the need for this

species to lose its Nationally Scarce status.

Laccobius atratus Hydrophilidae Coleoptera

Recent published records are for South Somerset, Dorset, South Wiltshire; East Sussex, Surrey, Carmarthen, Pembroke, Cardigan, Merioneth, North-east Yorkshire, Westmorland, South Northumberland, Kirkcudbrightshire, and Skomer. The northernmost confirmed record is an unpublished one for Ayrshire. Some questionable records for eastern England may refer to an as yet unrecognised taxon. *L. atratus* s.s. is a western European species, recorded from Ireland, France, Belgium, the Netherlands, Germany, and Spain.

Laccobius atratus is associated with hillside flushes, watershed and valley mires. *Laccobius* construct egg-cases close to the surface of the water with a mast protruding above the surface. Larvae hatch in 7-11 days and take 45-60 days to complete development; they are predatory. Pupation takes places in cells above water level and adults emerge in 3-5 days.

Laccobius atratus has been recorded from 37 hectads in England, 18 in Wales, and three in Scotland. The equivalent values since 1990 are 27, eight and two. There is no evidence of contraction in range but at least one valley mire in East Sussex was destroyed before it could be scheduled.

Tipula yerburyi Tipulidae Diptera

This crane fly is a southern species which appears to be relatively frequent in south-west England. It usually occurs in wet, usually acid woods and in southern England, there is a preference for sallow carr on heathland. The early stages are unknown but the larvae possibly live in wet soil. The adults have been recorded from May to July.

Dixa maculata Dixidae Diptera

Records of this meniscus midge are scattered widely in the northern and western parts of England (eleven recorded counties) with one record for Suffolk and Wales. There are about 20 known post 1960 sites according to Falk and Chandler (2005). The larvae live in shallow, stony streams usually in hilly areas. The adults have been recorded from January to October.

Ptychoptera longicauda Ptychopteridae Diptera

This relative of crane flies has a clumped distribution in southern England with clusters in Hampshire and Kent. The largest number of records are associated with calcareous areas in the Cotswolds and the southern part of the Welsh border (Falk and Chandler 2005). The habitat of this species comprises wooded streams with silted areas. At least half the sites are thought to have a calcareous influence. The larvae of this genus are aquatic, developing in muddy sediment in shallow water at the margins of springs and streams. The adults have been recorded from late June to early September.

Drapetis arcuata Hybotidae Diptera

This dance-fly was given Notable status by Falk but was downgraded in Falk and Crossley (2005).

Sphagina verecunda Syrphidae Diptera

This narrow-waisted hoverfly generally occurs along woodland streams and throughout damp woodlands. The larvae of *Sphagina* spp have been found in semi-submerged logs in streams and in sap runs. This species is widely distributed as far north as Cumbria and Durham, but there are few records for Scotland. The adults have been recorded from May to October and peak in June. More information is available in Falk (1991).

Threats to this species include the clearance of broadleaved woodland sites especially the damper areas near streams and conversion to agriculture or intensive forestry. Other threats include the ditching of streams, drainage of moist areas in woods and the removal of dead wood.

Habitat management should aim to maintain damp areas in woodland, especially those near streams, in an undisturbed state with a lush vegetation and retain any dead wood.

Xylota florum Syrphidae Diptera

This hoverfly is thinly but widely scattered in England and Wales. It normally occurs in woodland by water or in moist valleys, the adults often perching on fallen trees or sunbathing on logs partly submerged in marshes. The larvae are associated with decaying wood and sap. The adults have been recorded from June to October.

Sapromyza basalis Lauxaniidae Diptera

This lauxaniid fly has been recorded from scattered localities in southern England (seven counties listed by Falk and Ismay in prep.) as well as one county in North Wales. Records predominate in the west. Most records apply to broadleaved woodland and there may be a preference for damp woods with a well developed ground layer of vegetation. The early stages are unknown but the larvae of this family are generally believed to develop in decaying vegetable matter including fallen leaves. The adults have been recorded from July to October,

Sapromyza zetterstedti Lauxaniidae Diptera

Records of this lauxaniid fly are widely scattered in England (eleven counties listed by Falk and Ismay in prep.), Wales (three counties) and Scotland (nine counties). This species is associated with woodland possibly only coniferous or mixed. This species was reared from the cone of a Douglas fir from a site in Argyllshire although it is not clear if this is the normal breeding site. The adults have been recorded from May to September and at Pembrey Forest, Carmarthenshire, it was taken on pine logs, further suggesting an association with conifers. This species is widespread but localised with a northerly bias. About fifteen post-1960 sites are known.

Psacadina verbekei Sciomyzidae Diptera

This species has been recorded widely throughout England as far north as Yorkshire and Wales. A range of wetlands is used including fens, damp heaths, riversides and dune slacks. Standing water is a requirement, though records seem to relate to both bog and base-rich conditions. The larvae develop as parasitoids of aquatic snails such as *Lymnaea* and appear to be adapted for life at the margins of aquatic environments. Adults have been recorded from early April to mid October. This is a widespread but very local species with about 25 known post-1960 sites.

Threats to this species include the drainage of wetlands for agriculture or intensive forestry; complete or extensive clearance of marginal vegetation from water edges such as through river improvement schemes and ditching of streams; pollution such as agricultural run-off; mismanagement of water levels and subsequent scrub invasion. Habitat management for this species should aim to prevent the drainage of sites and provide a range of vegetation types including ditches, ponds, and their marginal vegetation. Seasonally fluctuating water levels may be important. Avoid scrub invasion though isolated shrubs and areas of carr may be beneficial.

Tetanocera punctifrons Sciomyzidae Diptera

Records for this snail-killing fly are scattered widely throughout England (nine counties or vice-counties), Wales (two counties) and Scotland (three counties) according to Falk (1991). This species is widespread but local with about 20 post-1960 sites in 1991. This species occurs in wetlands, damp woodland, riverside situations, damp heathland and coastal marshes. The larvae develop as predators or parasitoids of aquatic gastropod molluscs. The adults have been recorded from June to August.

Elachiptera pubescens Chloropidae Diptera

This is essentially a coastal species of southern England according to Falk and Ismay (in prep.). The recorded habitats include coastal grazing marsh and to a lesser extent, damp heathland, gravel pits and marshland. There may be a requirement for *Phragmites* beds. The early stages are unknown; the larvae probably develop in decaying vegetable matter although they may invade grass and reed stems. This species is widespread but local in the south, although may be locally frequent on the South Essex marshes. There are about twenty post-1960 sites according to Falk and Ismay (in prep.).

Meonura minutissima Carnidae Diptera

Records of this minute carniid fly are scattered widely with nine records cited by Falk and Ismay (in prep.). There are at least four post-1960 sites but it is likely that this species, along with other carniids, are grossly under-recorded. The habitat preferences of this species are unclear but recorded habitats include chalk grassland, moorland and woodland. The larval biology is unknown; members of this genus have been reared from a range of situations including birds nests, animal dung, possibly carrion and the damaged puparium of another fly. The adults have been recorded from May to July.