



Springs and Seepages of Wessex
Blackdown Hills Bryophyte Survey



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Summary

A number of springs and seepages in 7 different Sites of Special Scientific Interest (SSSIs) in the Blackdown Hills (Devon and Somerset) were surveyed to assess the nature of the bryophyte communities they support. The survey encompassed a wide range of sites, with 7 in the open, 2 in part shade and the remainder in woodland.

Two broadly distinct types of bryophyte community were encountered, with local variation induced by such influences as shading, management (grazing and/or poaching) and the presence or absence of microhabitat features. *Sphagnum*-based communities were characteristic of acid, peaty seepages at Blackdown & Sampford Commons, Ashculm Turbary and Ringdown, whilst mineral springs and seepages at Hense Moor, Ruttersleigh and Gotleigh & Southey Moor were characterised by a scattering of large pleurocarpous¹ mosses typical of neutral and fertile substrates. At Deadman, both types were sampled less than 100m apart. In general, shaded and heavily poached mineral sites were found to support the least diverse bryophyte communities.

¹ A term coined to describe many robust mosses with an obviously branched habit and laterally-borne capsules.

1. Introduction

A number of springs and seepages in 7 different Sites of Special Scientific Interest (SSSIs) in the Blackdown Hills (Devon and Somerset) were surveyed to assess the nature of the bryophyte communities they support. The survey encompassed a wide range of sites, with 7 in the open, 2 in part shade and the remainder in woodland.

2. Methodology

All seven SSSIs were surveyed between 8th and 17th of March 2011 by Sharon Pilkington CEnv MIEEM. The survey effort was targeted upon the specific sampling locations recorded by Andy Godfrey in the course of his invertebrate sampling in August 2010 and the numbering system adopted by him to identify each of the 16 survey locations has been continued here. A hand-held GPS receiver² was used to navigate to the ten-figure grid references recorded by him. In a few instances (mostly in woodland) the existing GPS reference did not seem to be in the correct type of habitat so the nearest seepage matching his habitat description was surveyed instead.

Then all species of moss, liverwort and hornwort present within the spring or seepage were recorded together with an estimate of local abundance using the DAFOR³ scale. Because the sites were so varied in extent and scale, this involved sampling all representative microhabitats present within the seepage where different species of bryophyte would typically be found, including;

- Irrigated ground with differing plant species and structure;
- Small rivulets and standing water;
- Stones;
- Decaying stumps and fallen wood;
- Tussocks of e.g. Greater Tussock-sedge *Carex paniculata* and Purple Moor-grass *Molinia caerulea*;
- Ant-hills and hummocks;
- Areas in full sun and areas below trees and scrub.

Epiphytes growing on the trunks and branches of trees overhanging the sample locations were not recorded as they were not considered to be true members of the wetland bryophyte communities.

Most species of moss, liverwort and hornwort found in the course of the survey could be identified with confidence in the field. However, in some instances, subsequent microscopic examination was required to confirm identity to species level.

A visual assessment of the condition of the bryophyte communities (and habitat) was also made and any obvious negative impacts or threats were identified.

3. Results

Descriptions of the general nature and bryological composition of each sampling site are laid out in this section. Bryological nomenclature follows Hill et al. (2008) whilst that for vascular plants follows Stace (2010). Grid references are given for the survey site locations.

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² Garmin model Vista HCX

³ Dominant; Abundant; Frequent; Occasional; Rare

3.1. Site Descriptions

3.1.1. Blackdown and Sampford Commons SSSI

The three locations in this large SSSI were all surveyed on 17th March.

Site 1: Windwhistle ST11392.16570

This site lay on a south-west-facing slope within an extensive acid seepage approximately 30 metres above the edge of a birch *Betula* woodland (Plate 1). The ground was wet and peaty with little standing water. It was dominated by low tussocks of *Molinia* and Soft-rush *Juncus effusus* together with scattered bushes of straggly Cross-leaved Heath *Erica tetralix* and occasional Western Gorse *Ulex gallii*. There was little bare peat and the vegetation looked as though it had been regularly but lightly grazed by ponies. Although *Sphagnum* mosses were quite frequent, total bryophyte cover was not high (estimated at <10%) due to the dominance of *Molinia*. Vegetation within the seepage was relatively homogeneous and there were few microhabitats.

Overall the habitat was considered to be in relatively good condition, if a little under-grazed. Uphill there was an extensive bank of gorse scrub and scrub encroachment may be a slight concern.



Plate 1. Site 1 looking downslope to a woodland edge.

Two common species of *Sphagnum* moss were abundant in this seepage. *Sphagnum palustre* and *S. subnitens* formed loose mounds between *Molinia* tussocks and provided a habitat for several small species of liverwort. Because the groundwater appeared to be very acidic and the seepage had few microhabitats, species diversity was found to be low. No notable bryophytes were found.

Species	Abundance
<i>Aneura pinguis</i>	R
<i>Aulacomnium palustre</i>	O
<i>Calypogeia fissa</i>	O
<i>Cephalozia connivens</i>	R
<i>Hypnum jutlandicum</i>	O

<i>Kurzia pauciflora</i>	R
<i>Sphagnum capillifolium</i>	R
<i>Sphagnum denticulatum</i>	O
<i>Sphagnum palustre</i>	A
<i>Sphagnum papillosum</i>	O
<i>Sphagnum subnitens</i>	A

Site 2: Black Down Common ST11443.16290

Site 2 lay within an extensive seepage line on a barely sloping plateau about halfway down a west-facing slope (Plate 2). The main seepage line appeared to lie below low peaty bluffs and within a small copse of Downy Birch *Betula pubescens*, though the majority of the habitat was unshaded. The entire adjacent hillside appeared to be irrigated and supported very similar vegetation. The ground was very wet and peaty with little standing water and the vegetation was characterised by abundant *Molinia* together with Common Cottongrass *Eriophorum angustifolium*, rushes *Juncus* spp., and Cross-leaved Heath.

There was significant (>10%) cover of robust mosses, especially *Sphagnum palustre*, *S. subnitens* and *Aulacomnium palustre* though diversity was not particularly high. In the dappled shade and shelter of the small birch copse, several species not present in the more open ground were noted, including *Sphagnum fallax*, *S. fimbriatum* and the liverwort *Calypogeia muelleriana*. No uncommon species were seen.

The vegetation appeared to have been regularly and lightly grazed by ponies and was in reasonable condition. A few birch saplings and occasional Western Gorse bushes were present in open areas but were no immediate threat to the bryophyte community.



Plate 2. Location 2 looking downhill to the west

Species	Abundance
<i>Aulacomnium palustre</i>	F
<i>Calypogeia fissa</i>	F
<i>Calypogeia muelleriana</i>	R

<i>Cephalozia connivens</i>	O
<i>Hypnum jutlandicum</i>	O
<i>Kurzia pauciflora</i>	O
<i>Sphagnum capillifolium</i>	O
<i>Sphagnum denticulatum</i>	O
<i>Sphagnum fallax</i>	LF
<i>Sphagnum fimbriatum</i>	R
<i>Sphagnum palustre</i>	A
<i>Sphagnum subnitens</i>	A
<i>Thuidium tamariscinum</i>	R

Site 3: Black Down Common ST11245.16038

This site lay on the same extensive west-facing flushed slope as Site 2, further downhill and close to a field boundary. In substrate and vegetation character it was very similar to Site 2, but had been quite heavily grazed and was rather poached (Plate 3). Consequently, it supported much lower cover of bryophytes (<5%) and a number of low-growing vascular plants not seen in the other sites in this SSSI, including Bulbous Rush *Juncus bulbosus* and a yellow-sedge *Carex viridula* aggregate. Otherwise the same suite of higher plant species were present, grazed down to 10-15cm.

No notable bryophytes were found in this site. As before, *Sphagnum palustre* and *S. subnitens* were the commonest bryophytes, joined here by *S. denticulatum*. The hooves of the ponies had broken up and trampled much of the bryophyte vegetation and this was definitely a negative impact on the larger species of the bryoflora.



Plate 3. Heavily grazed and poached ground at Site 3.

Species	Abundance
<i>Calypogeia fissa</i>	R
<i>Cephalozia bicuspidata</i>	R
<i>Hypnum jutlandicum</i>	O
<i>Kurzia pauciflora</i>	R
<i>Leucobryum glaucum</i>	R
<i>Riccardia multifida</i>	R
<i>Sphagnum denticulatum</i>	F
<i>Sphagnum palustre</i>	A
<i>Sphagnum subnitens</i>	F

3.1.2. Hense Moor SSSI

The three locations in this SSSI were all surveyed on 15th March.

Site 4: Overday Farm ST16637.07537

This site lay within a neutral seepage line in dappled shade above a small stream close to the foot of a steep, south-facing pasture (Plate 4). The stream lay in a deep gully at the foot of a near-vertical flushed 4m bank at the foot of the slope (Plate 5). The seepage line appeared to outcrop for 20-30 metres along the slope, giving way uphill to clay pasture. Soil in the upper part of the seepage was muddy, wet and heavily poached by the livestock. The flushed stream bank cut through a consolidated gravelly bedrock and was mostly inaccessible to livestock, being too steep.

This seepage was too wet and churned up to support many bryophytes and it was characterised by bare mud with patches of higher plants. The most abundant of these were Opposite-leaved Golden-saxifrage *Chrysosplenium oppositifolium*, Water-purslane *Lythrum portula*, Yorkshire-fog *Holcus lanatus*, Creeping Buttercup *Ranunculus repens*, Cuckooflower *Cardamine pratensis* and a sweet-grass *Glyceria* sp. Here and there were loose patches of *Brachythecium rivulare* together with occasional tufts of *Philonotis fontana*. *Kindbergia praelonga* was frequent but only where stones afforded some relief from the muddy ground. The stream bank did not support any different species and was mostly devoid of bryophytes. No notable species were recorded in this site, and the diversity of bryophytes was very low.



Plate 4. Poached seepage line. Note stream below to left.



Plate 5. Flushed stream bank several metres high

Species	Abundance
<i>Brachythecium rivulare</i>	F
<i>Brachythecium rutabulum</i>	R
<i>Dicranella staphylina</i>	R
<i>Kindbergia praelonga</i>	F
<i>Philonotis fontana</i>	F
<i>Sciuro-hypnum populeum</i>	R

Site 5: Overday Farm ST16729.07539

Lying in the same stream valley as Site 4 this site comprised a cluster of small seepages in open Alder *Alnus glutinosa* – Grey Willow *Salix cinerea* woodland (Plate 6). The ground around these seepages was moderately poached by livestock and was wet and muddy, giving way just uphill to shaded clay pasture. These seepages comprised a mixture of open muddy ground and carpets of Opposite-leaved Golden-saxifrage and sweet-grass together with Water-purslane, Brooklime *Veronica beccabunga* and Creeping Buttercup.

The seeps supported few bryophytes, apart from a few tufts of *Brachythecium rivulare*. Slightly drier ground had good populations of *Kindbergia praelonga* and the common thalloid liverwort *Pellia epiphylla*. Taking in additional habitat features such as the vertical banks of a small pool and rotting wood increased the bryophyte diversity, adding *Rhizomnium punctatum*, *Atrichum undulatum* and *Thamnobryum alopecurum* in small quantity. Most species were typical of damp wooded ground however and no notable species were seen.



Plate 6. Ochraceous seep in wet woodland

Species	Abundance
<i>Atrichum undulatum</i>	F
<i>Brachythecium rivulare</i>	A
<i>Brachythecium rutabulum</i>	O
<i>Chiloscyphus polyanthos</i>	O
<i>Dichodontium pellucidum</i>	R
<i>Hypnum cupressiforme</i>	O
<i>Isothecium myosuroides</i>	O
<i>Kindbergia praelonga</i>	A
<i>Lophocolea bidentata</i>	O
<i>Mnium hornum</i>	O
<i>Pellia epiphylla</i>	F
<i>Plagiothecium denticulatum</i>	O
<i>Polytrichastrum formosum</i>	R
<i>Rhizomnium punctatum</i>	O
<i>Thamnobryum alopecurum</i>	O
<i>Thuidium tamariscinum</i>	R

Site 6: Gulley Hayes ST17004.08226

A cluster of small stony springs and mineral seepages in semi-natural woodland at the head of a small east-facing valley, Site 6 had a number of different microhabitats. Above the spring-line the wood was characterised by mature Ash *Fraxinus excelsior* trees with a sparse understorey of Hazel *Corylus avellana* and a ground flora dominated by Dog's Mercury *Mercurialis perennis*. The wetter ground supported a tangle of sprawling Grey Willow bushes. The seepages were muddy and supported little vegetation; springs discharged into small stony rivulets (Plate 7) which supported a diverse, if typical stream bryoflora. The robust moss *Brachythecium rutabulum* was abundant, along with frequent *Rhizomnium punctatum*, the riparian moss *Platyhypnidium riparium* and the liverworts *Scapania undulata* and *Chiloscyphus polyanthos*. Stream banks supported a range of typical woodland floor mosses and many of the willows and other scrub in the area had good populations of common epiphytes. The woodland was fenced off from nearby improved grazing pasture and livestock did not have access to the area.

Although Site 6 supported a moderately diverse and relatively undisturbed community of bryophytes, there were no uncommon species.



Plate 7. Site 6, woodland springs

Species	Abundance
<i>Brachythecium rivulare</i>	A
<i>Brachythecium rutabulum</i>	O
<i>Chiloscyphus polyanthos</i>	F
<i>Dichodontium pellucidum</i>	R
<i>Hookeria lucens</i>	R
<i>Kindbergia praelonga</i>	F
<i>Lophocolea bidentata</i>	O
<i>Mnium hornum</i>	R
<i>Pellia epiphylla</i>	R
<i>Plagiomnium undulatum</i>	A
<i>Platyhypnidium riparioides</i>	F
<i>Rhizomnium punctatum</i>	F
<i>Scapania undulata</i>	F
<i>Thamnobryum alopecurum</i>	F
<i>Thuidium tamariscinum</i>	R

3.1.3. Ruttersleigh SSSI

The three locations in this SSSI were surveyed on the 10th of March.

Site 7: Mount Fancy Farm ST25159.16202

Sites 7 and 8 were very close together and had been given the same grid reference in the invertebrate survey (ST25156.16211). Site 7 incorporated the channel of a very small stream taking the flow from a cluster of small springs and seepages rising in willow carr. This channel was only a few centimetres deep and had a sluggish flow. It lay in shade under a line of large Beech *Fagus sylvatica* trees and held many decaying leaves. This section supported just a few bryophytes on low, sloping banks. Just upstream the channel lay within willow carr and was more interesting (Plate 8). The very common mosses *Kindbergia praelonga* and *Mnium hornum* were abundant on the banks along with a handful of other ubiquitous species growing with Opposite-leaved Golden-saxifrage and Creeping Buttercup.

Two uncommon species were present at this site. The liverwort *Calypogeia muelleriana* crept over decomposing stools of Greater Tussock-sedge on the bank in one place and a small population of the moss *Sciuro-hynum plumosum* grew at the water's edge.



Plate 8. Channel of small stream below seepage line

Species	Abundance
<i>Atrichum undulatum</i>	R
<i>Brachythecium rivulare</i>	R
<i>Brachythecium rutabulum</i>	O
<i>Calypogeia muelleriana</i>	O
<i>Isothecium myosuroides</i>	O
<i>Kindbergia praelonga</i>	A
<i>Lepidozia reptans</i>	O
<i>Lophocolea bidentata</i>	R
<i>Mnium hornum</i>	F

<i>Pellia endiviifolia</i>	O
<i>Polytrichastrum formosum</i>	R
<i>Pseudotaxiphyllum elegans</i>	O
<i>Sciuro-hypnum plumosum</i>	R

Site 8: Mount Fancy Farm ST25158.16192

This site was a small muddy ochraceous seep only a few metres across next to the small stream channel (Site 7). It lay on flat ground at the edge of Grey Willow carr and had several prominent degenerate tussocks of Greater Tussock-sedge (Plate 9). The wettest parts of the seep had no vegetation but slightly drier ground supported carpets of Creeping Buttercup, Cuckooflower and Opposite-leaved Golden-saxifrage.

The peaty sedge tussock-bases supported the main bryophyte populations in this site and of note was an abundance of the uncommon liverwort *Calypogeia muelleriana*. Overall bryophyte diversity was very low at Site 8.



Plate 9. Degenerate sedge tussock in seep at Site 8, home to *Calypogeia muelleriana*

Species	Abundance
<i>Brachythecium rivulare</i>	R
<i>Brachythecium rutabulum</i>	O
<i>Calypogeia muelleriana</i>	LA
<i>Kindbergia praelonga</i>	F
<i>Mnium hornum</i>	O
<i>Orthodontium lineare</i>	R
<i>Plagiothecium denticulatum</i>	R
<i>Polytrichastrum formosum</i>	O

Site 9: Britty ST25834.16115

Site 9 occupied a seepage line rising in wet pasture above an old hedge bank below mature Sycamore *Acer pseudoplatanus* trees. It lay on gently sloping, partially shaded muddy ground moderately poached by grazing animals. Below, a small stony rivulet carried water downhill. The ground was dominated by Opposite-leaved Golden-saxifrage, Creeping Buttercup and Cuckooflower and cover of bryophytes was very low (<5%). The poached muddy ground had very few bryophytes at all but a stony part of the seepage (Plate 10) supported a strong population of *Brachythecium rivulare*. These stones provided an important microhabitat and were also home to populations of *Kindbergia praelonga* and *Lophocolea bidentata*.

Although diversity of this seepage was very low, another one nearby in poached open ground on the other side of the hedgebank was looked at informally (not part of Site 9) and was found to support a large population of the uncommon hornwort *Anthoceros punctatus*, the first sighting in the vice-county of South Somerset (VC5) for at least 50 years (confirmed by S.D.S Bosanquet, hepatics recorder for the British Bryological Society).



Plate 10. Site 9 – stony seepage at left and the hedgebank in the foreground.

Species	Abundance
<i>Atrichum undulatum</i>	O
<i>Brachythecium rivulare</i>	F
<i>Isothecium myosuroides</i>	O
<i>Kindbergia praelonga</i>	F
<i>Lophocolea bidentata</i>	F
<i>Oxyrrhynchium hians</i>	LF
<i>Platyhypnidium riparioides</i>	O
<i>Rhizomnium punctatum</i>	O

3.1.4. Deadman SSSI

The two locations in this SSSI were surveyed on the 10th of March.

Site 10: Yarty Moor ST23541.15847

Near the foot of a long slope with an easterly aspect, Site 10 was one of many small flushes rising in an area of open culm grassland (Plate 11). *Molinia* and rushes *Juncus* spp. dominated the vegetation in a slightly hummocky topography without much surface water. Although the vegetation had been grazed recently, the peaty ground was not poached. *Sphagnum* mosses were frequent but total cover of bryophytes was less than 10%. Many of them were associated with mounds formed by higher plants.

Some other seepages elsewhere at Yarty Moor were quite base-rich, supporting uncommon bryophytes such as *Sphagnum subsecundum*, but Site 10 was not one of those. Instead, it supported populations of typical calcifuge species especially *Sphagnum tenellum*, *S. denticulatum* and, on tussocks, *Hypnum jutlandicum*. No uncommon bryophytes were present, but it was a relatively diverse site.



Plate 11. Site 10 at Yarty Moor

Species	Abundance
<i>Bryum</i> sp.	R
<i>Calliergonella cuspidata</i>	R
<i>Calypogeia fissa</i>	R
<i>Campylopus flexuosus</i>	R
<i>Campylopus introflexus</i>	O
<i>Cephalozia bicuspidata</i>	R
<i>Dicranum bonjeanii</i>	R
<i>Dicranum scoparium</i>	O
<i>Hypnum jutlandicum</i>	F
<i>Leucobryum glaucum</i>	R

<i>Odontoschisma sphagni</i>	R
<i>Sphagnum denticulatum</i>	F
<i>Sphagnum palustre</i>	R
<i>Sphagnum tenellum</i>	F

Site 11: Yarty Moor ST23500.15815

Site 11 was on the same slope and at about the same altitude as Site 10 but was situated in very dense tussocky vegetation dominated by *Molinia* (Plate 12), below an area of recent scrub clearance. Other higher plant species present included Soft-rush and other rushes *Juncus* spp., Marsh Thistle *Cirsium palustre*, Cuckooflower and Lesser Spearwort *Ranunculus flammula*. Although the peaty ground was moist there was little visible surface water, other than a few tiny rivulets flowing through the *Molinia*. This vegetation had been lightly grazed. This seepage appeared to be neutral in character and there was no *Sphagnum*. The only frequent bryophytes were large straggly pleurocarpous mosses including *Calliergonella cuspidata*, *Kindbergia praelonga* and *Brachythecium rutabulum*. A small population of the uncommon moss *Climacium dendroides* grew between the tussocks.



Plate 12. Dense *Molinia* dominating Site 11.

Species	Abundance
<i>Brachythecium rivulare</i>	R
<i>Brachythecium rutabulum</i>	F
<i>Calliergonella cuspidata</i>	F
<i>Climacium dendroides</i>	R
<i>Kindbergia praelonga</i>	F
<i>Lophocolea bidentata</i>	R
<i>Plagiomnium affine</i>	R
<i>Plagiomnium undulatum</i>	R
<i>Pseudoscleropodium purum</i>	R
<i>Rhytidiadelphus</i>	R

<i>squarrosus</i>	
<i>Thuidium tamariscinum</i>	R

3.1.5. Ashculm Turbary SSSI

The two locations in this SSSI were surveyed on the 8th of March.

Site 12: Brownheath ST14620.15638

This site lay in flushed birch-willow woodland close to the bottom of a gentle east-facing slope (Plate 13). The ground was very wet and peaty and lay close to a small rivulet trickling downhill. Much of the area upslope was similarly irrigated but the site was juxtaposed with drier woodland supporting e.g. oak *Quercus* sp(p)., Holly *Ilex aquifolium* and Bracken *Pteridium aquilinum*. The seepage was characterised by occasional tussocks of *Molinia* and Broad Buckler-fern *Dryopteris dilatata* growing within extensive carpets of such mosses as *Sphagnum flexuosum*, *S. denticulatum*, *Polytrichastrum formosum* and *Thuidium tamariscinum*. Bryophyte diversity was not high and small leafy liverworts were absent. No notable species were recorded at this site.



Plate 13. Woodland seepage (Site 12)

Species	Abundance
<i>Calliergonella cuspidata</i>	R
<i>Hypnum cupressiforme</i>	O
<i>Kindbergia praelonga</i>	O
<i>Leucobryum glaucum</i>	R
<i>Mnium hornum</i>	R
<i>Pellia epiphylla</i>	R
<i>Polytrichastrum formosum</i>	A
<i>Pseudoscleropodium purum</i>	R
<i>Rhizomnium punctatum</i>	R
<i>Sphagnum denticulatum</i>	LA
<i>Sphagnum flexuosum</i>	A
<i>Sphagnum palustre</i>	O

<i>Sphagnum subnitens</i>	R
<i>Thuidium tamariscinum</i>	F

Site 13: Ashculm Turbary open area ST14664.15764

Site 13 was a very wet, gently sloping seepage extending over a large area, with plenty of surface water. It was interesting for bryophytes as it appeared to take groundwater of different chemistry and consequently supported a diverse range of species. Part of the seepage had been fenced off within an enclosure (seen in Plate 14) – this area was not surveyed. Vegetation outside the enclosure was hard-grazed but tussocks of *Molinia* prevailed and together with low bushes of Western Gorse and degenerate Ling *Calluna vulgaris* and Cross-leaved Heath provided sheltered niches above the prevailing wet ground. Part of the seepage supported calcicolous species including *Campylium stellatum* and *Aneura pinguis*, whilst *Sphagnum palustre*, *S. denticulatum* and a range of other calcifuges were abundant elsewhere. Several small leafy liverworts such as *Kurzia pauciflora* and *Cephalozia connivens* typically grew over and within *Sphagnum* plants, especially where *Molinia* and higher vegetation afforded some shelter.

Despite the diversity of species present there, the seepage had been badly degraded by livestock (thought to be ponies but not seen). The fragile peaty ground had been severely poached (Plate 15) and the action of the hooves had broken up most of the mounds of *Sphagnum palustre* – leaving dead plants crushed and trampled into the peat. Within the fenced enclosure *Sphagnum* mosses were abundant and well-grown, indicating what the adjacent area could be like with more sympathetic grazing. Outside, live bryophytes occupied less than 10% of the vegetation.



Plate 14. Site 13 – note the enclosure in the distance



Plate 15. Site 13 - severely poached seepage

Species	Abundance
<i>Aneura pinguis</i>	R
<i>Calypogeia fissa</i>	R
<i>Calypogeia muelleriana</i>	O
<i>Campylium stellatum</i>	LA
<i>Cephalozia bicuspidata</i>	O
<i>Cephalozia connivens</i>	R
<i>Dicranella heteromalla</i>	R
<i>Hookeria lucens</i>	R
<i>Hypnum jutlandicum</i>	O
<i>Kurzia pauciflora</i>	R
<i>Leucobryum glaucum</i>	R
<i>Pellia epiphylla</i>	R
<i>Pohlia nutans</i>	R
<i>Riccardia chamedryfolia</i>	R
<i>Sphagnum capillifolium</i>	O
<i>Sphagnum denticulatum</i>	O
<i>Sphagnum palustre</i>	F
<i>Sphagnum subnitens</i>	O

3.1.6. Ringdown SSSI

The two locations in this SSSI were surveyed on the 8th of March.

Site 14: Woodland ST17764.15480

This site lay within wet woodland below the seepage line of Site 15. Many small seeps occurred on relatively flat ground juxtaposed with patches of drier woodland. It lay in the shade of sprawling Grey Willow and birch trees (Plate 16) and there were many fallen leaves on the woodland floor. The ground was very wet and peaty with a number of decaying tree stumps and fallen branches. More woodland lay downhill to the west. Bryophytes dominated the vegetation in the seepage, attaining up to 80% cover, though Soft-rush and Remote Sedge *Carex remota* were also frequent. As well as the ubiquitous *Sphagnum palustre*, shade-tolerant mosses such as *S. fimbriatum* and *S. squarrosum* were frequent, together with a number of other species also present in Site 15. No notable species were found.



Plate 16. Site 14 in willow carr

Species	Abundance
<i>Hypnum jutlandicum</i>	O
<i>Lepidozia reptans</i>	R
<i>Leucobryum glaucum</i>	R
<i>Mnium hornum</i>	F
<i>Pellia epiphylla</i>	R
<i>Plagiothecium undulatum</i>	R
<i>Polytrichum commune</i>	O
<i>Pseudoscleropodium purum</i>	O
<i>Pseudotaxiphyllum elegans</i>	R
<i>Sphagnum denticulatum</i>	F
<i>Sphagnum fimbriatum</i>	LA

<i>Sphagnum flexuosum</i>	F
<i>Sphagnum palustre</i>	F
<i>Sphagnum squarrosum</i>	LA
<i>Tetraphis pellucida</i>	R
<i>Thuidium tamariscinum</i>	O

Site 15: Open area ST17790.15489

This site (Plate 17) lay within a large seepage approximately 100m long and 20-30m wide, lying on an open, west facing slope above wet woodland. It was dominated by *Molinia*, together with good cover of a number of sedges and rushes and Cross-leaved Heath. The vegetation had been grazed down to 10-20 cm but the peaty ground was not poached. Bryophytes formed an important component of the vegetation, with *Sphagnum* mosses accounting for up to half of the cover.

Groundwater irrigating the site appeared to be acidic and base-poor and the most abundant species were *Sphagnum palustre*, *S. denticulatum*, *S. flexuosum* and *Aulacomnium palustre*, with *Hypnum jutlandicum* and *Pseudoscleropodium purum* more characteristic of drier hummocks and mounds. A number of rotting tree stumps were also present and these provided a locus for other species such *Campylopus flexuosus* and *Lepidozia reptans*.

A small area at the northern end of the seepage supported a local concentration of calcicolous species such as *Calliergonella cuspidata*, *Campylium stellatum* and *Riccardia chamaedryfolia*.

This site provided the greatest number of bryophyte species in any of the sites but no notable species were recorded there.



Plate 17. Site 15 looking north.

Species	Abundance
<i>Atrichum undulatum</i>	R
<i>Aulacomnium palustre</i>	A
<i>Brachythecium rivulare</i>	R
<i>Bryum capillare</i>	R
<i>Calliergonella cuspidata</i>	LA
<i>Calypogeia fissa</i>	O
<i>Campylium stellatum</i>	R
<i>Campylopus flexuosus</i>	O
<i>Campylopus pyriformis</i>	R
<i>Cephalozia bicuspidata</i>	R
<i>Dicranum scoparium</i>	O
<i>Hookeria lucens</i>	R
<i>Hypnum cupressiforme</i> agg.	R
<i>Hypnum jutlandicum</i>	F
<i>Kindbergia praelonga</i>	O
<i>Lepidozia reptans</i>	R
<i>Leucobryum glaucum</i>	R
<i>Lophocolea bidentata</i>	R
<i>Mnium hornum</i>	O
<i>Pellia epiphylla</i>	R
<i>Plagiothecium curvifolium</i>	R
<i>Polytrichastrum formosum</i>	O
<i>Pseudoscleropodium</i> <i>purum</i>	F
<i>Rhytidiadelphus</i> <i>squarrosus</i>	O
<i>Riccardia chamedryfolia</i>	R
<i>Sphagnum cuspidatum</i>	O
<i>Sphagnum denticulatum</i>	F
<i>Sphagnum flexuosum</i>	A
<i>Sphagnum palustre</i>	A
<i>Sphagnum subnitens</i>	R
<i>Tetraphis pellucida</i>	R
<i>Thuidium tamariscinum</i>	F

3.1.7. Southey and Gotleigh Moors SSSI

The single location in this SSSI was surveyed on the 15th of March. Although only a single wooded mineral seepage was surveyed as part of the current project, a look at nearby peaty flushes in open ground indicated that parts of Gotleigh Moor at least support some notable bryophytes. Of particular interest was a large population of the uncommon base-loving *Sphagnum subsecundum* and a small population of the uncommon hornwort *Anthoceros punctatus* in flushed, poached ground near a stream.

Site 16: ST18869.10609

Site 16 lay on the western side of a small valley draining down into a small stream. A strong seepage line outcropped on the slope in woodland dominated by mature Alder *Alnus glutinosa*. The woodland floor was very wet and muddy and did not support many vascular plants apart from sweet-grass, Soft-rush, Cuckooflower, Creeping Buttercup and Broad Buckler-fern. Diversity of bryophytes was equally low and total bryophyte cover did not exceed 5%. The only species noted on the wet ground were small tufts of *Brachythecium rivulare*, occasional patches of *Hookeria lucens* and the thalloid liverwort *Pellia epiphylla*. Other bryophytes seemed to prefer slightly drier conditions afforded by e.g. tree bases. The woodland floor appeared to be lightly grazed but was not significantly poached. No notable species were recorded here.



Plate 18. Flushed alderwood (Site 16)

Species	Abundance
<i>Atrichum undulatum</i>	F
<i>Brachythecium rivulare</i>	F
<i>Brachythecium rutabulum</i>	O
<i>Calliergonella cuspidata</i>	F
<i>Dicranella heteromalla</i>	F
<i>Hookeria lucens</i>	R
<i>Kindbergia praelonga</i>	F
<i>Mnium hornum</i>	O

<i>Pellia epiphylla</i>	O
<i>Plagiothecium succulentum</i>	R
<i>Polytrichastrum formosum</i>	O
<i>Pseudoscleropodium purum</i>	R

4. Discussion

Bryophytes can broadly be divided into three categories for the purposes of habitat association. There are the generalists, species that are not particularly fussy about habitat and management influences and as a result, tend to be common and widespread. A moss like *Brachythecium rivulare* for example, might be found in flushes, streams, wet grassland and tufa flows. Then there are the habitat-associated species which are nearly always associated with a specific but broad kind of habitat or vegetation community. For example, *Sphagnum fallax* and *Aulacomnium palustre* are both found in a range of wet, peaty acidic habitats, such as flushes, valley mires and poor-fens. The third group includes the real specialists, those species that are often found only in habitats with particularly specific environmental conditions, such as (in the context of the Blackdown Hills) calcareous groundwaters (*Campylium stellatum*) and peaty tussocks of grasses and sedges (*Calypogeia muelleriana*).

It is also possible to infer a considerable amount of information about environmental conditions within a particular habitat from the bryophyte community it supports (Hill et. al 2007). In this case, the springs and seepages sampled in the current survey could be divided into two broad groups which are summarised in Table 1.

Acidic (base-poor) seepages and springs typically are peaty, have a low pH and are relatively infertile. They normally support a number of different bog-mosses (*Sphagnum* species) including such species as *Sphagnum capillifolium*, *S. papillosum* and *S. tenellum* in the most infertile sites, together with small calcifuge liverworts such as *Odontoschisma sphagni*, *Kurzia pauciflora* and *Cephalozia connivens*. Of the sites sampled, four (1, 2, 10 and 13) appear to fall in this category. Slightly less acidic and more fertile groundwater tends to produce peaty seepages with a high frequency of such species as *Sphagnum palustre*, *S. flexuosum*, *S. subnitens* and *Aulacomnium palustre*. The only open site in this category was Site 15. However, both of the wooded acid seepages (Sites 12 and 14) could also be placed here, due to the nutrient enrichment of the ground that occurs as a result of regular nutrient inputs from fallen leaves. The influence of shade and shelter also play a major part in defining the species present in wooded seepages, with shade tolerant species e.g. *Sphagnum fimbriatum* and *Mnium hornum* replacing some of the more light-demanding ones.

Most of the other seepages were mineral (mud) based and appeared to be irrigated by more neutral and fertile groundwater. These sites did not support *Sphagnum* mosses and tended to have much lower cover of bryophytes on the ground. Instead, bryophytes were more confined to features such as stones, banks, stumps and tree bases. In seepages with a light flow of water, the most characteristic species was the moss *Brachythecium rivulare*, often with frequent *Calliergonella cuspidata*, *Kindbergia praelonga* and the liverwort *Lophocolea bidentata* on stones and wood. In general, the bryophyte diversity of these neutral seepages was low, though they did tend to be poached by livestock, which didn't enhance diversity. Interestingly, despite the overall low diversity of the neutral seeps, some of the more notable species found in the survey (*Anthoceros punctatus*, *Calypogeia muelleriana*, *Sciuro-hypnum plumosum*, *Climacium dendroides*) were associated with relatively neutral seepages. There was not much difference in diversity between open and shaded sites.

Site 6 (Hense Moor) was slightly distinct from the others in that it featured a number of small undisturbed springs discharging into small stony streamlets. The additional habitat diversity of the stream channels meant that a different group of stream-associated bryophytes were found in this site. Species typical of running water habitats included the leafy liverworts *Chiloscyphus polyanthos*, *Scapania undulata* and the small moss *Dichodontium pellucidum*.

No extensive examples of base-rich seepages or springs were found among the surveyed sites. However, there was some species-based evidence that base-rich but relatively infertile water was irrigating parts of Site 13 and 15. These seepages were typically defined by an abundance of *Campylium stellatum* and the small thalloid liverwort *Aneura pinguis*.

Table 1. Characteristics of sites

Site no.	SSSI	Open wooded or	Likely soil/water reaction	Likely nutrient levels
1	Blackdown & Sampford	Open	Acid	Infertile
2		Mostly open	Acid	Infertile
3		Open	Acid	Slightly enriched
4	Hense Moor	Semi-shaded	Neutral	Fertile
5		Wooded	Neutral	Fertile
6		Wooded	Neutral to acid	Fertile
7	Ruttersleigh	Wooded	Neutral	Fertile
8		Wooded	Neutral	Fertile
9		Semi-shaded	Neutral	Fertile
10	Deadman	Open	Acid	Infertile
11		Open	Neutral	Fertile
12	Ashculm Turbary	Wooded	Acid	Slightly enriched
13		Open	Predominantly acid	Infertile
14	Ringdown	Wooded	Acid	Slightly enriched
15		Open	Predominantly acid	Slightly enriched
16	Southey & Gotleigh	Wooded	Neutral	Fertile

In conclusion, the most bryologically interesting seepages and springs were those where the groundwater appeared to be relatively acid and nutrient-poor. Other positive indicators included an open, well-illuminated aspect, light to moderate grazing and the presence of a good number of micro-habitat features (such as stones and rotting wood).

5. References

Hill M.O., Preston C.D., Bosanquet S.D.S. and Roy D.B. 2007. **BRYOATT: Attributes of British and Irish Mosses and Hornworts**. NERC Centre for Ecology and Hydrology and Countryside Council for Wales.

Hill M.O., Blackstock T.H., Long D.G. and Rothero G.P. 2008. **A Checklist and Census Catalogue of British and Irish Bryophytes**. British Bryological Society.

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Appendix 1: Species status

Species	Type of lower plant	Status ⁴
<i>Aneura pinguis</i>	Liverwort	Common
<i>Anthoceros punctatus</i>	Hornwort	Uncommon/local
<i>Atrichum undulatum</i>	Moss	Common
<i>Aulacomnium palustre</i>	Moss	Common
<i>Barbula unguiculata</i>	Moss	Common
<i>Brachythecium rivulare</i>	Moss	Common
<i>Brachythecium rutabulum</i>	Moss	Common
<i>Bryum capillare</i>	Moss	Common
<i>Calliergonella cuspidata</i>	Moss	Common
<i>Calypogeia fissa</i>	Liverwort	Common
<i>Calypogeia muelleriana</i>	Liverwort	Uncommon/local
<i>Campylium stellatum</i>	Moss	Common
<i>Campylopus flexuosus</i>	Moss	Common
<i>Campylopus introflexus</i>	Moss	Common
<i>Campylopus pyriformis</i>	Moss	Common
<i>Cephalozia bicuspidata</i>	Liverwort	Common
<i>Cephalozia connivens</i>	Liverwort	Common
<i>Chiloscyphus polyanthos</i>	Liverwort	Common
<i>Climacium dendroides</i>	Moss	Uncommon/local
<i>Dichodontium pellucidum</i>	Moss	Common
<i>Dicranella heteromalla</i>	Moss	Common
<i>Dicranella staphylina</i>	Moss	Common
<i>Dicranum bonjeanii</i>	Moss	Common
<i>Dicranum scoparium</i>	Moss	Common
<i>Homalothecium sericeum</i>	Moss	Common
<i>Hookeria lucens</i>	Moss	Common
<i>Hypnum cupressiforme</i>	Moss	Common
<i>Hypnum jutlandicum</i>	Moss	Common
<i>Isothecium myosuroides</i>	Moss	Common
<i>Kindbergia praelonga</i>	Moss	Common
<i>Kurzia pauciflora</i>	Liverwort	Common
<i>Lepidozia reptans</i>	Liverwort	Common
<i>Leucobryum glaucum</i>	Moss	Common
<i>Lophocolea bidentata</i>	Liverwort	Common
<i>Mnium hornum</i>	Moss	Common
<i>Odontoschisma sphagni</i>	Liverwort	Common
<i>Orthodontium lineare</i>	Moss	Common
<i>Oxyrrhynchium hians</i>	Moss	Common
<i>Pellia endiviifolia</i>	Liverwort	Common
<i>Pellia epiphylla</i>	Liverwort	Common
<i>Philonotis fontana</i>	Moss	Common
<i>Plagiomnium affine</i>	Moss	Common
<i>Plagiomnium undulatum</i>	Moss	Common
<i>Plagiothecium curvifolium</i>	Moss	Common
<i>Plagiothecium denticulatum</i>	Moss	Common
<i>Plagiothecium succulentum</i>	Moss	Common

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⁴ None of these species have a national status e.g. Nationally Scarce. These statuses have been assigned according to surveyor knowledge and should be regarded as indicative.

Species	Type of lower plant	Status ⁴
<i>Plagiothecium undulatum</i>	Moss	Common
<i>Platyhypnidium riparioides</i>	Moss	Common
<i>Pohlia nutans</i>	Moss	Common
<i>Polytrichastrum formosum</i>	Moss	Common
<i>Polytrichum commune</i>	Moss	Common
<i>Pseudoscleropodium purum</i>	Moss	Common
<i>Pseudotaxiphyllum elegans</i>	Moss	Common
<i>Rhizomnium punctatum</i>	Moss	Common
<i>Rhynchostegium confertum</i>	Moss	Common
<i>Rhytidiadelphus squarrosus</i>	Moss	Common
<i>Riccardia chamedryfolia</i>	Liverwort	Common
<i>Riccardia multifida</i>	Liverwort	Common
<i>Scapania undulata</i>	Liverwort	Common
<i>Sciuro-hypnum plumosum</i>	Moss	Uncommon/local
<i>Sciuro-hypnum populeum</i>	Moss	Common
<i>Sphagnum capillifolium</i>	Moss	Common
<i>Sphagnum cuspidatum</i>	Moss	Common
<i>Sphagnum denticulatum</i>	Moss	Common
<i>Sphagnum fallax</i>	Moss	Common
<i>Sphagnum fimbriatum</i>	Moss	Common
<i>Sphagnum flexuosum</i>	Moss	Common
<i>Sphagnum palustre</i>	Moss	Common
<i>Sphagnum papillosum</i>	Moss	Common
<i>Sphagnum squarrosus</i>	Moss	Common
<i>Sphagnum subnitens</i>	Moss	Common
<i>Sphagnum subsecundum</i>	Moss	Uncommon/local
<i>Sphagnum tenellum</i>	Moss	Common
<i>Tetraphis pellucida</i>	Moss	Common
<i>Thamnobryum alopecurum</i>	Moss	Common
<i>Thuidium tamariscinum</i>	Moss	Common