

Bryophyte & lichen Survey of Bainton Heath

Final Report



Jonathan Graham, 13 March 2012

fenland botanical surveys



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Summary

A bryophyte and lichen survey was undertaken at Bainton Heath (an approximately 46 hectare site) on 14 & 15 December 2011 and 28 February 2012. Full bryophyte and lichen species lists and species accounts are provided.

Seven broad habitats have been identified that support bryophytes and lichens at Bainton Heath. These are planted trees (plantation woodlands and boundary hedges), scrub, heathy vegetation, tall grassland, short (rabbit grazed) grassland, pools & northern boundary drain, and miscellaneous artificial habitats (surface natural stones, old wooden railway sleepers, brick and concrete rubble). From these 7 habitats, a total of 45 bryophytes (7 liverworts & 38 mosses) and 40 lichens have been identified.

The most important habitats for bryophytes and lichens at Bainton Heath are planted trees (plantation woodlands and boundary hedges), scrub and heathy vegetation. Heathy vegetation supports locally uncommon calcifuge species including the mosses *Dicranum scoparium*, *Polytrichum juniperinum*, a species of the liverwort Genus *Cephaloziella* and lichens *Cladonia furcata ssp. furcata*, *Peltigera rufescens*.

Planted trees (plantation woodlands and boundary hedges) and scrub support a broad range of epiphytic bryophytes and lichens including many species that were previously rare in eastern England and are now beginning to spread with cleaner air and reducing levels of Sulphur Dioxide. These include the mosses *Cryphaea heteromalla*, *Orthotrichum pulchellum*, *Orthotrichum lyellii* and lichens *Parmotrema perlatum*, *Flavoparmelia caperata*, *Ramalina fastigiata*.

The remaining habitats identified of tall grassland, short (rabbit grazed) grassland, pools & northern boundary drain, and miscellaneous artificial habitats (surface natural stones, old wooden railway sleepers, brick and concrete rubble) are less important supporting either low numbers of bryophytes and lichens, or in the case of short (rabbit grazed) grassland, a moderate number of generally common and “weedy” species.

Two species, a species of the liverwort Genus *Cephaloziella* and the lichen *Cladonia furcata ssp. furcata* (both species associated with areas of heathy vegetation) at Bainton Heath are additionally considered to be noteworthy as being scarce in eastern England (and particularly within the wider Peterborough area).

A series of management recommendations are provided for bryophytes and lichens occurring within broad habitats.

Introduction

Bainton Heath is an approximately 46 hectare site situated just north-east of the village of Bainton and approximately 10km north-west of the city of Peterborough in eastern England.

Bainton Heath has had a complex history. The site was originally quarried for sand and gravel which created a number of small lakes which were fished by local people. After 1945, many of these lakes were filled with rubble (apparently including rubble derived from the London blitz) and the general surface of the site was used as a tip for waste ash from power stations. In addition, the site has a number of surface banks with track ways (possibly former railway sidings).

There is still much evidence of the sites industrial past with the surface composed of a wide range of dumped materials including natural limestone and sand stones (including cut house stones), bricks, concrete, railway sleepers, rusted metal, fly ash and occasional slag. The result of this surface, which contains a great amount of fly ash in places, is that mildly acidic grassland and "heathy" vegetation has developed over large parts of the site contrasting greatly with the more usual calcareous grassland that has developed on the exposed sand and gravel of the adjoining Bainton fishing lakes.

Bainton Heath is now an important regional site for nightingales which utilise the extensive scrub and the heathy vegetation that has developed on the site is quite unusual within Cambridgeshire and the wider Peterborough area.

Methods

Bainton Heath was surveyed on 14 & 15 December 2011 and 28 February 2012. Approximately eighteen hours were spent in total carrying out the survey which was undertaken in fine but often overcast weather.

Full bryophyte and lichen species lists have been obtained for the site by searching all relevant habitats including epiphytes on planted trees and scrub, grassland and heathy vegetation, pools and northern boundary drain and a range of miscellaneous artificial habitats (including including old railway sleepers, natural surface stones, brick and concrete rubble).

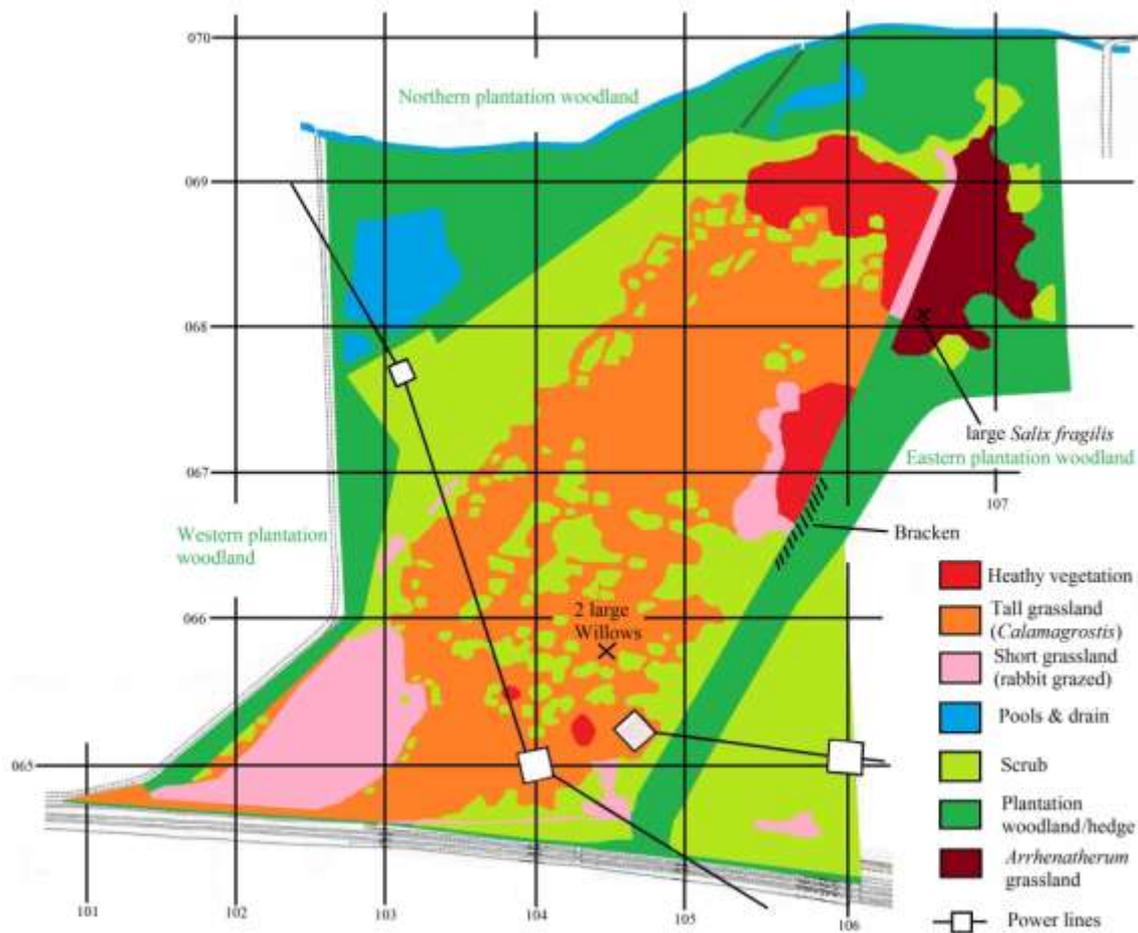
The majority of species were identified in the field using a x20 hand lens or for some lichens the addition of standard field chemical tests. For critical species, small specimens were collected and checked microscopically.

Map 1 shows the site boundary and highlights important habitat features.

Photographs were taken of key habitat types as well as interesting bryophyte and lichen species.

Map 1

Bainton Heath (Site Boundary and Habitat Features)



Descriptions of bryophyte & lichen communities

A number of distinct bryophyte and lichen communities have been recognized within Bainton Heath. These are planted trees (old plantation woodlands and boundary hedges), scrub, heathy vegetation, tall grassland, short (rabbit grazed) grassland, pools & northern boundary drain, and miscellaneous artificial habitats (surface natural stones, old wooden railway sleepers, brick and concrete rubble). Descriptions of each of these communities and site species accounts follow.

Planted trees (old plantation woodlands and boundary hedges)

Bainton Heath is bordered by a number of old linear plantation woodlands named for the purposes of this report as the western, northern and eastern plantation woodlands. These woodlands were originally mainly Hybrid Black Poplar *Populus x canadensis* plantations with occasional plantings of Scots Pine *Pinus sylvestris*. However, many species including Ash *Fraxinus excelsior*, Sycamore *Acer pseudoplatanus*, Hawthorn *Crataegus monogyna*, Elder *Sambucus nigra* and Goat Willow *Salix caprea* have naturalized within these plantations over time so that they are now rather dense and scrubby in places.



Photo 1 (left) semi-mature Sycamore naturalized amongst planted Hybrid Black Poplars (eastern plantation woodland)
(right) young Elder trees naturalized under planted Hybrid Black Poplars (northern plantation woodland)

The plantation woodlands have reasonably well developed epiphyte communities although it is noticeable that the eastern plantation woodland is considerably poorer in epiphytes than the other two plantation woodlands. This is likely due to a combination of reduced humidity (a result of its s.w. facing aspect) and prevailing south westerly winds bringing airborne pollutants from adjoining agricultural land.

Great variation exists in structural form of trees with smooth barked trunks, thick-barked (fissured) trunks, branches and twigs all provide niches for epiphytic bryophytes and lichens. In addition, aspect, variation in light levels between different parts of a tree, and base richness of bark all affect composition and distribution of species.

Planted Scots Pine are very poor for epiphytes while some of the larger planted Hybrid Black Poplars have well developed epiphytes with mosses *Orthotrichum diaphanum*, occasional *Dicranoweisia cirrata* and very locally *Orthotrichum lyellii*. The lichens *Diploicia canescens* and *Phaeophyscia orbicularis* occur on well illuminated poplar trunks. Deeper fissures in the bark of larger poplars (especially those planted in the more humid eastern plantation woodland) are a micro habitat for small liverworts including *Frullania dilatata*, *Lophocolea heterophylla*, *Metzgeria furcata* and very locally *Metzgeria violacea*.



Photo 2 (left) acrocarpous moss *Orthotrichum lyellii* on trunk of large planted Hybrid Black Poplar (northern plantation woodland)
(right) robust lichen *Flavoparmelia caperata* on trunk of mature naturalized Hawthorn (eastern plantation woodland)

Larger naturalized trees (Ash, Sycamore, Hawthorn, Elder and Goat Willow) are considerably more interesting for epiphytes than the planted trees. Generally the lower trunks of many trees are dominated by the pleurocarpous mosses *Rhynchostegium confertum*, *Hypnum cupressiforme* and occasionally *Brachythecium rutabulum*. The trunks and upper branches of mature Hawthorns, in particular, additionally support foliose lichens such as *Parmotrema perlatum*, *Parmelia sulcata*, *Flavoparmelia caperata*, *Punctelia subrudecta*, *Ramolina farinacea* and very locally the moss *Orthotrichum pulchellum*. The upper branches of large elders support rich acrocarpous moss communities with *Orthotrichum diaphanum*, *Orthotrichum affine* and locally *Cryphaea heteromalla* as well as occasionally more interesting lichens such as *Lecania cyrtella* and *Physconia grisea*. The smooth bark of Goat Willow supports a slightly different species mix of epiphytes with lichens *Parmelia sulcata*, *Melanelia subaurifera*, cushions of the moss *Orthotrichum affine* and occasionally the

small liverworts *Metzgeria furcata*, *Frullania dilatata*. The smooth and slightly base-rich bark of naturalized sycamores (when well illuminated) are often covered in lichens such as *Lecanora chlarotera*, *Lecidella elaeochroma* and *Ramolina farinacea*.

A few isolated trees are of note that are not associated with either woodland or scrub. These include a few scattered larger sycamores, large Crack Willow at TF1065 0681 with the liverwort *Metzgeria furcata*, nr. eastern plantation woodland; 2 large Willows at TF 1045 0657, with the moss *Cryphaea heteromalla*, s. end of site associated with scrub. It is possible that these larger trees may originally of been planted.

The ground under trees in the plantation woodlands is often heavily shaded, has dense leaf litter and is regularly disturbed by deer. Consequently lichens are poorly represented and bryophytes are restricted to the shade tolerant pleurocarpous moss *Kindbergia praelonga* and very locally the moss *Plagiomnium undulatum*. The leafy liverwort *Lophocolea bidentata* occurs very locally on rotting logs with the moss *Brachythecium rutabulum*.

Scrub

Large parts of Bainton Heath comprises Elder and Hawthorn scrub which varies in both age and density. Much of the older scrub (with trees approaching 15cm diameter) closely adjoins the plantation woodlands suggesting that scrub has spread across the site from the plantation woodlands. Recent coppicing has also opened up areas of scrub so that great variety in light levels exists favouring a broad range of epiphytes.



Photo 3 (left) well illuminated Elder dominated scrub, nr. western plantation woodland
(right) Hawthorn dominated scrub, centre of site

Many of the epiphytic bryophytes and lichens are similar to those on mature scrub within the plantation woodlands and epiphytes are similarly more abundant on scrub towards the north and east of the site. However, the frequently higher light levels associated with the areas of scrub encourages a number of extra species including the pleurocarpous moss *Homalothecium sericeum* on mature Elders, the lichens *Ramalina fastigiata* and locally *Evernia prunastri* on the twigs of Hawthorn. In sheltered humid patches of scrub, the small acrocarpous mosses *Zygodon viridissimus* and *Syntrichia montana* occur, the latter species occurring unusually as an epiphyte being more typically a moss of lime-rich rocks. In addition, the outer twigs of Hawthorn support an abundance of common lichens such as *Xanthoria parietina* and *Physcia adscendens*.



Photo 4 (left) rich epiphytic moss community dominated by *Orthotrichum affine* on Elders, e. section of site
(right) lichen *Ramalina fastigiata* (with apothecia) associated with *Physcia adscendens* on twig of a mature Hawthorn in Elder & Hawthorn scrub, central section of site

An interesting feature of the scrub is the regular presence of old stems of Dog Rose *Rosa canina* agg. which support the lichens *Lecanora symmicta* and *Arthonia radiata*.



Photo 5 (left) epiphytic lichens *Lecanora chlarotera* and *Xanthoria parietina* on isolated (well illuminated) semi-mature sycamore, n. section of site (right) lichens *Lecanora symmicta* and *Arthonia radiata* on old stem of Dog Rose, within scrub, s. section of site

The ground under scrub is often heavily shaded and similar to the ground within the plantation woodlands and supports a small number of mosses such as *Kindbergia praelonga*, *Brachythecium rutabulum* and more locally *Pseudoscleropodium purum*, *Plagiomnium undulatum*.

Heathy vegetation

An unusual feature of Bainton Heath is the presence of “heathy” vegetation that has developed on acidic peaty surface deposits that relate to the sites complex history of infilling with various types of rubble and fly ash.

Heathy vegetation is characterized by short vegetation which is dominated by the grey lichen *Cladonia furcata* ssp. *furcata*, a rare species within the wider Peterborough area and confined to small patches on old railway ballast (pers. observations of the author). Other species include the calcifuge mosses *Polytrichum juniperinum*, *Dicranum scoparium* and the lichens *Cladonia chlorophaea*, *Peltigera rufescens*. Of particular interest is the occurrence of a minute leafy liverwort with red leaf gemmae, a *Cephaloziella* species growing in small quantity on the shaded side of a rotten railway sleeper at ground level within the main area of heathy vegetation to the n.e. of the site (TF1061 0687). Being non fertile, this plant cannot be named to species but all species of the genus *Cephaloziella* are rare in the eastern England, particularly within the wider Peterborough area.



Photo 6 (left) heathy vegetation dominated by the grey lichen *Cladonia furcata* ssp. *furcata*, n. part of site
 (right) calcifuge acrocarpous moss *Polytrichum juniperinum*, n. part of site



Photo 7 (left) calcifuge acrocarpous moss *Dicranum scoparium*, n. part of site
 (right) lichen *Peltigera rufescens* (with chestnut apothecia), s. part of site

Tall grassland

Large parts of the centre of Bainton Heath comprise tall rank grassland dominated by Wood Small-reed *Calamagrostis epigejos* and there is a smaller rank patch of tall grassland dominated by Common False-oat *Arrhenatherum elatius* towards the north-east corner.



Photo 8 (left) Rank *Calamagrostis* grassland bordered by young scrub, central part of site
 (right) robust form of the common pleurocarpous moss *Hypnum cupressiforme* (one of the few bryophytes to persist in rank grassland), n. part of site

Both these types of tall grassland, especially the *Calamagrostis* dominated grassland, are botanically species poor generally and of low value for bryophytes and lichens which are quickly out competed by the taller grass stems. Only a small number of robust mosses were recorded including *Kindbergia praelonga*, *Brachythecium rutabulum*, *Pseudoscleropodium purum*, *Plagiomnium undulatum*, a robust form of *Hypnum cupressiforme* and very locally the leafy liverwort *Lophocolea bidentata*.

Short (rabbit grazed) grassland

Short rabbit grazed grassland occurs throughout Bainton Heath, although often in small quantity, associated with banks, old paths and track ways (some possibly relating to former railway lines) and adjoining areas of heathy vegetation.



Photo 9 (left) largest area of short (rabbit grazed) grassland, s.w. corner of site
(right) short (rabbit grazed) grassland associated with track way (possibly former railway line), n. end of site

These short grassland areas are acidic but differ from the heathy areas by being noticeably rabbit grazed (evident by presence of rabbit droppings), by lack of dominance of the grey lichen *Cladonia furcata ssp. furcata* and by having very low cover or absence of the calcifuge mosses *Polytrichum juniperinum*, *Dicranum scoparium*. In addition, they support a greater number of mosses generally with many species characteristic of leached sand dune systems that are typically also rabbit grazed. Such species include *Brachythecium albicans*, *Ceratodon purpureus* and *Syntrichia ruralis*. A number of weedy acrocarpous mosses also occur that are more typically found associated with arable field margins or disturbed tracks. These include *Barbula convoluta*, *Pseudocrossidium hornschuchiana*, *Bryum rubens*, *Bryum dichotomum* and more locally *Plagiomnium affine*, *Phascum cuspidatum*.



Syntrichia ruralis



Ceratodon purpureus



Brachythecium albicans



Bryum dichotomum

Photo 10 (left) short (rabbit grazed) grassland with mosses *Syntrichia ruralis*, *Brachythecium albicans*, s.w. corner of site
 (right) short (rabbit grazed) grassland (possibly former railway line) with *Ceratodon purpureus*, *Bryum dichotomum*, n. end of site

Pools & northern boundary drain

Three pools are present at the Bainton Heath, a large pool (with an adjoining small pool) at TF 1032 0684 and a smaller pool at TF 1057 0694. All 3 pools occur within the northern plantation woodland.



Photo 11 (left) smaller pool at TF 1057 0694, within northern plantation woodland
(right) northern boundary drain

The margins of these pools are often heavily shaded, covered by leaf litter and disturbed (and unstable) due to foraging by deer. No lichens were recorded as directly associated with the pools and only a smaller number of shade tolerant bryophytes were present including the moss *Kindbergia praelonga* on soil, the mosses *Brachythecium rutabulum*, *Rhynchostegium confertum* and *Amblystegium serpens* on exposed stones and tree roots, and very locally the leafy liverwort *Lophocolea bidentata* on soil banks and exposed stones. Locally, the thalloid liverwort *Pellia endiviifolia* forms dense sheets on heavily shaded sandy soil banks next to pools under scrub and plantation trees. This typically calcicole species occurs on soil that is neutral or slightly calcareous and derived from earlier sand and gravel workings (prior to fly ash tipping).

The soil margins of the northern boundary drain are similarly heavily shaded and disturbed. Only the moss *Kindbergia praelonga* occurs in small quantity on exposed soil between dense leaf litter although 2 species of the moss genus *Fissidens* were recorded in one place (TF1058 0699) on a steep stable bank of the drain below Hawthorn roots and next to an old bridge. Several patches of *Fissidens taxifolius* were seen along with a single fruiting plant of *Fissidens bryoides*.

Miscellaneous artificial habitats (surface natural stones, railway sleepers, brick and concrete rubble).

Surface natural stones

Natural stones are distributed across the surface of Bainton Heath and include limestone and sandstone (some of which is mildly base-rich). These stones were probably originally part of older buildings, gate posts and walls before being dumped at the site and comprise a small portion of the total amount of tipped rubble (most being brick and concrete). When these stones occasionally become exposed in well illuminated situations (particularly within open areas of heathy vegetation), they provide an important natural habitat for a number of calcareous saxicolous bryophyte and lichen species. These include the lichens *Phaeophyscia nigricans*, *Caloplaca citrina*, *Lecidella stigmatea*, *Verrucaria nigrescens* and the mosses *Tortula muralis*, *Grimmia pulvinata*. Where these stones become nutrient enriched (likely through them functioning as bird perches), additional lichens such as *Lecanora muralis* and *Physcia caesia* also occur.



Photo 12 (left) exposed limestone rock with lichens *Lecanora muralis* (prominent white/grey patches), *Phaeophyscia nigricans* and mosses *Tortula muralis*, *Grimmia pulvinata*, n. part of site
(right) shaded old railway sleepers under Elder & Hawthorn scrub, central part of site

Old wood wooden railway sleepers

Occasionally, old wooden railway sleepers occur on the site but mostly these occur in shade under patches of scrub and support only the robust pleurocarpous moss *Brachythecium rutabulum*. Less shaded sleepers occasionally support the moss *Ceratodon purpureus* and the lichens *Cladonia chlorophaea*, *Xanthoria parietina*.

Brick and concrete rubble

Brick and concrete (including breeze blocks) is widespread across the surface of the Bainton Heath and comprises the larger portion of the total amount of tipped rubble. The species most frequently on exposed bricks is the small common moss *Tortula muralis* while heavy shaded bricks support shade-tolerant pleurocarpous mosses such as *Amblystegium serpens*, *Kindbergia praelonga* and occasionally the leafy liverwort *Lophocolea bidentata*.



Photo 13 (left) exposed bricks under Elder & Hawthorn scrub, central part of site
(right) well illuminated dumped pile of concrete breeze blocks with mosses *Tortula muralis*, *Syntrichia montana* and locally *Syntrichia ruralis*, s. part of site

Considerably more species are associated with concrete rubble (especially when in piles and well illuminated) including the mosses *Orthotrichum diaphanum*, *Bryum capillare*, *Syntrichia montana*, *Grimmia pulvinata* and occasionally the lichens *Lecanora albescens*, *Caloplaca flavescens* and moss *Orthotrichum anomalum*. The acrocarpous moss *Orthotrichum affine* (usually an epiphyte) was recorded once (atypically) on a breeze block. Also, where piles of concrete blocks have not been moved for some time, the flat upper surfaces of the blocks can become nutrient enriched (usually by a fine deposit of windblown soil) and support the additional mosses *Syntrichia ruralis*, *Bryum argenteum*.

Bainton Heath - Individual Species Accounts

For locations and key habitats within the site refer to map 1. Nomenclature for bryophytes follows the Checklist of British & Irish Bryophytes (British Bryological Society 2009) and nomenclature for lichens follows British Lichens – Checklist of Lichens & Lichenicolous Fungi (Coppins 2002 and as updated by the British Lichen Society Web Site).

Standard chemical tests for lichens are given as C+ = a positive colour change reaction to Calcium Hypochlorite (traditional household bleach), K+ = a positive colour change reaction to a 10% solution of Potassium Hydroxide and Pd+ = a positive colour change reaction to Paraphenylenediamine (crystals).

For species occurring in 3 or less locations within the site, 8-figure grid references are provided.

Bryophytes

Liverworts

***Cephaloziella* sp.**

Rare, several non fertile patches growing in small quantity on the shaded side of a rotten railway sleeper at ground level within the main area of heathy vegetation (TF1061 0687).

Frullania dilatata

Rare, single patch (2 x 2 cm) on w. facing ash trunk within the northern plantation woodland (TF1042 0690), single patch (4 x 6 cm) on s. facing trunk of large Hybrid Black Poplar in eastern plantation woodland (TF 1056 0662); single patch (4 x 6 cm) on n. facing trunk of mature Hawthorn in eastern plantation woodland (TF 1058 0650) associated with *Metzgeria furcata*. Perianths not seen.

Lophocolea bidentata

Uncommon in short grassland associated with paths and old tracks, on the ground beneath younger scrub, mixed with other bryophytes such as *Kindbergia praelonga*, on rotting logs at ground level in plantation woodland, on exposed bricks at ground level, patches on stones at margins of largest pool.

Lophocolea heterophylla

Rare (often in small quantity) on the bases of large Hybrid Black Poplars in eastern plantation woodland (TF 1056 0662).

Metzgeria furcata

Uncommon. Small patches (typically 2x2 cm) on trunks of Goat Willow, Ash, Hybrid Black Poplar and occasionally on mature Hawthorn in northern and eastern plantation woodlands; rarely outside of plantation woodlands such as in fissure of s. w. facing Crack Willow in close proximity to eastern plantation woodland (TF1065 0681). Female branches (with very immature capsules) seen once.

Metzgeria violacea

Rare, single patch (1 x 1 cm) on w. facing trunk of large Hybrid Black Poplar (near ground level) in eastern plantation woodland (TF 1056 0662).

Pellia endiviifolia

Occasional, locally forming dominant stands on heavily shaded sandy soil banks next to pools under scrub and plantation trees. The soil of these banks is neutral or slightly calcareous and derived from earlier sand and gravel workings (prior to fly ash tipping). Distinctive proliferous growth of thalli present in most populations.

Mosses

Amblystegium serpens

Common throughout the site on bases of plantation trees, on branches of scrub (particularly Elder), on shaded soil banks, on stones and bricks, occasional on fallen semi-rotten branches.

***Barbula convoluta*
*var. convoluta***

Occasional in short rabbit grazed and disturbed grassland of paths, old tracks and sandy banks. Associated with *Barbula unguiculata*, *Bryum rubens* and occasionally *Phascum cuspidatum var. cuspidatum*, *Bryum dichotomum*, *Bryum argenteum*. Occasionally on exposed sandstones. With immature capsules.

***Barbula convoluta*
*var. sardoa***

In the same habitats as (and often mixed with) *Barbula convoluta var. convoluta* but more frequent. With immature capsules.

Barbula unguiculata

Uncommon, in short rabbit grazed and disturbed grassland of paths, old tracks associated with *Barbula unguiculata*, *Bryum rubens*. Also on slightly calcareous soil banks typically in the vicinity of pools (derived from earlier sand and gravel workings prior to fly ash tipping). In these situations it is associated with *Tortula muralis*.

<i>Brachythecium albicans</i>	This species is characteristic of acid grassland and leached late staged dune systems and is abundant across the open (non scrub or wooded) areas of the site. It is particularly prominent in the shorter rabbit grazed areas of grassland where it is the dominant bryophyte. Frequently associated with <i>Ceratodon purpureus</i> and occasionally <i>Bryum rubens</i> . This species becomes greatly reduced in extent or absent in tall grassland dominated by <i>Calamagrostis epigejos</i> or within heathy stands dominated by the lichen <i>Cladonia furcata</i> .
<i>Brachythecium rutabulum</i>	Abundant across the site on bases of plantation trees, on lower trunks of Hawthorn and Elder in scrub, on fallen semi-rotten branches, rotten logs (including old railway sleepers), on thin soil covering brick and concrete rubble, occasional in grassland (usually where less acidic).
<i>Bryum argenteum</i>	Occasional in short disturbed grassland of paths and old tracks associated with <i>Barbula convoluta</i> , <i>Bryum rubens</i> and occasionally <i>Bryum dichotomum</i> . Also on thin wind-blown soil overlying concrete rubble associated with <i>Syntrichia ruralis</i> .
<i>Bryum capillare</i> var. <i>capillare</i>	Common on concrete rubble, on trunks of plantation trees (hybrid poplar and ash), on larger branches in scrub (particularly on elder).
<i>Bryum dichotomum</i>	Infrequent in short disturbed grassland of paths and old tracks associated with <i>Barbula convoluta</i> , <i>Bryum rubens</i> and occasionally <i>Bryum argenteum</i> .
<i>Bryum rubens</i>	Common in shorter rabbit grazed and disturbed grassland (including grassland of paths and old tracks). Associated with <i>Barbula convoluta</i> and <i>Ceratodon purpureus</i> . All plants seen with protuberant (often axillary) tubers (220um), and bordered leaves (although many plants with rather narrow cells, 8-10um).
<i>Ceratodon purpureus</i>	Closely associated with <i>Brachythecium albicans</i> , this species is characteristic of acid grassland and leached late staged dune systems. It is abundant across the open (non scrub or wooded) areas of the site especially in shorter rabbit grazed areas of grassland but becomes greatly reduced in extent or absent in

tall grassland dominated by *Calamagrostis epigejos* or within heathy stands dominated by the lichen *Cladonia furcata*. Occasionally occurs on old railway sleepers.

Cryphaea heteromalla

An uncommon epiphyte on large branches of naturalized mature Elder and Hawthorn in the northern and eastern plantation woodlands. Also on mature Elder and Hawthorn in sheltered scrub (notably within the triangular patch of scrub towards the s.e. corner of the site). This species is beginning to increase in eastern England as a result of reduced Sulphur Dioxide levels. Occasional plants with capsules.

Dicranum scoparium

Occasional (locally frequent) in short mildly acidic rabbit grazed grassland especially associated with old tracks and boundary banks. In these situations, it occurs with *Barbula convoluta*, *Ceratodon purpureus*, *Bryum rubens*, *Brachythecium albicans*. Also occurring in heathy vegetation associated with *Hypnum cupressiforme* (robust form), *Polytrichum juniperinum* and the lichens *Cladonia chlorophaea*, *Cladonia furcata*.

Dicranoweisia cirrata

Uncommon (always in small quantity) within bark fissures of trunks of large well illuminated planted Hybrid Black Poplars in plantation woodland. Capsules not seen.

Didymodon insulanus

Rare, cushions on thin soil covering heavily shaded concrete block in eastern plantation woodland. This species is abundant (locally dominant) on the thin calcareous soil overlying exposed sand and gravel of the adjoining fishery gravel pits but very rare at Bainton Heath due to the generally acidic overlying substrate.

Fissidens bryoides

Rare, single plant (with capsule) at TF1058 0699, shaded but stable s. soil bank of northern boundary drain below Hawthorn roots and next to an old bridge. Associated with *Fissidens taxifolius*.

***Fissidens taxifolius*
var. *taxifolius***

Rare several patches at TF1058 0699, shaded but stable s. soil bank of northern boundary drain below Hawthorn roots and next to an old bridge, associated with *Fissidens bryoides*. Without capsules.

<i>Grimmia pulvinata</i>	Common on concrete rubble associated with <i>Orthotrichum affine</i> and <i>Tortula muralis</i> , occasionally on bricks at ground level, rare as an epiphyte on larger branches of elder in scrub. Capsules frequent.
<i>Homalothecium sericeum</i>	Unusually rare, seen twice on the lower trunks of well illuminated mature Elders in open scrub (that has been recently coppiced) at TF 10370673 and TF 10380681. Capsule not seen.
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>	Common on logs and lower trunks of planted trees in plantation woodlands, on trunks of naturalized Ash in plantation woodlands, locally abundant on trunks of mature Hawthorn in scrub, occasionally on thin humus overlying exposed sand stones. Capsules frequent on epiphytic plants in more humid areas of scrub. Robust non fertile plants occur in heathy vegetation and occasionally in taller grassland associated with <i>Pseudoscleropodium purum</i>
<i>Hypnum cupressiforme</i> var. <i>resupinatum</i>	Occasional on trunks and larger branches of mature Elder in sheltered scrub.
<i>Kindbergia praelonga</i>	Common in medium to tall grassland, grassland under scrub, on bases of larger broad-leaved trees in plantation woodland, on shaded logs and soil in plantation woodlands.
<i>Orthotrichum affine</i>	A common epiphyte on trunks of Ash, Sycamore and Hybrid Black Poplar in plantation woodlands, as an epiphyte in scrub (particularly on Elder), on naturalized and planted Willows (<i>Salix cinerea</i> , <i>S. caprea</i> , <i>S. fragilis</i>), seen once (atypically) on concrete rubble. Associated with <i>Orthotrichum diaphanum</i> and lichens <i>Xanthoria parietina</i> , <i>Phaeophyscia orbicularis</i> , <i>Physcia adscendens</i> . Old capsules frequent.
<i>Orthotrichum anomalum</i>	Rare on concrete rubble associated with <i>Grimmia pulviniata</i> , <i>Syntrichia montana</i> , <i>Tortula muralis</i> . Capsules frequent.

- Orthotrichum diaphanum*** A very common epiphyte, in similar situations to *O. affine* but more tolerant of drier conditions and considerably more frequent. On trunks of Ash, Sycamore and Hybrid Black Poplar in plantation woodlands, as an epiphyte in scrub (particularly on Elder), on naturalized and planted Willows and concrete rubble. Locally forming dominant stands on trunks of large planted Hybrid Black Poplars. Capsules frequent.
- Orthotrichum lyellii*** Rare, 4 tufts on w. facing trunk of a suckering Hybrid Black Poplar (1.5m above ground level) in the northern plantation woodland (TF 1055 0692). Leaves with abundant characteristic gemmae.
- Orthotrichum pulchellum*** Rare, single tuft on twig of mature Hawthorn (1.5m above ground level) in the northern plantation woodland (TF 1055 0692). With capsules.
- Phascum cuspidatum*
*var. cuspidatum*** Rare in short disturbed grassland of paths and old tracks associated with *Barbula convoluta*, *Bryum rubens* and occasionally *Bryum argenteum*. With very immature developing capsules.
- Plagiomnium affine*** Occasional (locally frequent) forming sheets in short mildly acidic rabbit grazed grassland especially associated with old tracks and boundary banks. Associated with *Barbula convoluta*, *Bryum rubens* and occasionally *Brachythecium albicans*. Occasionally persisting in areas of heathy vegetation associated with *Dicranum scoparium* and *Polytrichum juniperinum* but absent from vegetation dominated by the lichen *Cladonia furcata*.
- Plagiomnium undulatum*** Uncommon and rather local on soil in plantation woodlands and within shaded grassland under scrub, seen once at margins of area of heathy vegetation.
- Polytrichum juniperinum*** Occasional (locally frequent) in short mildly acidic rabbit grazed grassland especially associated with old tracks and boundary banks. In these situations, it occurs with *Barbula convoluta*, *Dicranum scoparium*, *Ceratodon purpureus*, *Bryum rubens*, *Brachythecium albicans*. Also occurring in heathy vegetation

associated with *Hypnum cupressiforme* (robust form) and the lichens *Cladonia chlorophaea*, *Cladonia furcata*.

Pseudoscleropodium purum

Frequent in medium to tall grassland associated with paths and old tracks, in grassland under scrub associated with *Kindbergia praelonga* and occasionally *Hypnum cupressiforme* (robust form), *Plagiomnium undulatum*. This is also one of the few bryophytes able to persist (albeit in small quantity) within taller dominant stands of *Calamagrostis epigejos*.

***Pseudocrossidium
hornschuchiana***

Uncommon in short disturbed grassland of paths and old tracks (usually where less acidic) associated with *Barbula convoluta* var. *sardoa*, *Bryum rubens* and occasionally *Phascum cuspidatum*, *Brachythecium albicans*

Rhynchostegium confertum

Very abundant across the site on bases of plantation trees (where it is often the dominant species), on lower trunks of Hawthorn and Elder in scrub and on exposed sand stone. Capsules common.

Syntrichia montana

Occasional (an unusually) occurring as an epiphyte on upper branches of mature and well illuminated Elders in shaded mature scrub. Rare on more typical habitat of concrete rubble associated with *Grimmia pulviniata*, *Tortula muralis* and occasionally *Orthotrichum anomalum*. Epiphytic plants occasionally fruiting (with mature capsules), saxicolous plants rarely with immature capsules.

Syntrichia ruralis

Occasional in short rabbit grazed grassland (associated with *Brachythecium albicans*), on thin wind-blown soil overlying concrete rubble associated with *Bryum argenteum* and on nutrient-rich soil piles and banks with *Barbula unguiculata*.

Tortula muralis

Common on concrete rubble associated with *Orthotrichum diaphanum* and *Grimmia pulviniata*, occasionally on bricks at ground level. Also on slightly calcareous soil banks typically in the vicinity of pools (derived from earlier sand and gravel workings (prior to fly ash tipping). In these situations it is associated with *Barbula unguiculata*. Capsules common.

Zygodon viridissimus

A rare epiphyte, single patch (2 x 2 cm) on upper branch of a well illuminated mature Elder in open scrub (that has been recently coppiced) at TF 10370673 associated with *Syntrichia montana*; tuft on upper branch of mature Hawthorn in mature sheltered scrub at TF 1055 0656, s.e. corner of site. Gemmae abundant (30um diameter but without cross walls)

Lichens

Arthonia radiata

Occasional on mature stems of Dog Rose in scrub. Associated with *Lecanora symmicta* and occasionally *Candelariella vitellina*. Apothecia common.

Caloplaca citrina

Rare on exposed sandstone (which is mildly calcareous).

Caloplaca flavescens

Rare, (in small quantity) on older and larger concrete rubble (particularly breeze blocks).

Candelariella vitellina

Occasional on trunks and larger branches of Hawthorn and old Dog Rose stems in scrub.

Cladonia chlorophaea

Frequent on logs and old wooden railway sleepers, on thin peaty soil overlying exposed stones and on the ground in "heathy vegetation". Mature podetia frequent but only on well grown plants in more humid situations at or near to ground level [K-].

Cladonia coniocraea

Common on trunks and larger branches in scrub (especially on Hawthorn). Most plants are small with immature or poorly developed podetia.

***Cladonia furcata*
*ssp. furcata***

Locally abundant within patches of "heathy" vegetation, short (<10cm) open vegetation on dark peaty substrate (often acidic with small black fragments of fly ash still present). Associated with the mosses *Dicranum scoparium*, *Polytrichum juniperinum*. Brown apothecia noted several times (but only in the n. part of the site). [Podetia K-, Pd+]

Diploicia canescens

Occasional (often in small quantity) on lower trunks of large Hybrid Black Poplars in northern plantation woodland.

<i>Evernia prunastri</i>	Rare on outer twigs of mature Hawthorns in sheltered mature Hawthorn and Elder scrub and seen once on trunk of semi-mature Ash in northern plantation woodland. All plants seen are tiny and poorly developed.
<i>Lecania cyrtella</i>	Rare (and in small quantity) on upper branches of naturalized mature Elder in scrub (particularly where sheltered and more humid). Apothecia common.
<i>Lecanora albescens</i>	Rare, (in small quantity) on older and larger concrete rubble (particularly breeze blocks). With apothecia.
<i>Lecanora campestris</i>	Rare on exposed sandstone (which is mildly calcareous). With apothecia.
<i>Lecanora chlorotera</i>	Common on trunks, branches and outer twigs of trees (especially smooth-barked species) including Sycamore, Ash and Hybrid Black Poplar, and on mature Hawthorn and Dog Rose in scrub. Apothecia frequent.
<i>Lecanora dispersa</i>	Rare (and in small quantity) on exposed sandstone (which is mildly calcareous) and limestone. Often with apothecia.
<i>Lecanora expallens</i>	Frequent (but often in small quantity) on trees in plantation woodlands, sorediate crusts on Hybrid Black Poplar and once on Sycamore.
<i>Lecanora campestris</i>	Occasional on exposed sandstone (which is mildly calcareous) and seen once on nutrient enriched stone rubble. With apothecia.
<i>Lecanora symmicta</i>	Occasional on mature stems of Dog Rose in scrub. Associated with <i>Arthonia radiata</i> . Apothecia common.
<i>Lecidella elaeochroma</i>	Common on trunks, branches and outer twigs of trees (especially smooth-barked species) including Sycamore, Ash and Hybrid Black Poplar, and on mature Hawthorn and Dog Rose in scrub. Apothecia frequent.
<i>Lecidella stigmatea</i>	Rare on well illuminated exposed calcareous stones (mostly limestone) in open areas towards the n. part of the site, associated with <i>Verrucaria nigrescens</i> and <i>Caloplaca citrina</i> . With apothecia.

<i>Lepraria incana</i>	Occasional on the lower trunks of acid barked trees such as mature Hawthorn and larger Willows (<i>Salix caprea</i> & <i>S. fragilis</i>). Also occasionally growing over thin peaty soil or bryophytes on exposed sandstones.
<i>Flavoparmelia caperata</i>	Rare, seen once on upper branches (2.5m above ground) of naturalized mature Hawthorn in eastern plantation woodland (TF 1054 0654). Associated with <i>Parmotrema perlatum</i> [medulla K+ yellow].
<i>Melanelia subaurifera</i>	Frequent on trunks and larger branches of mature Hawthorn, Ash and Willows (<i>Salix caprea</i> & <i>S. fragilis</i>) in scrub and plantation woodlands. Often associated with mosses <i>Orthotrichum affine</i> , <i>O. diaphanum</i> .
<i>Opegrapha sp.</i>	Lower trunks of large Hybrid Black Poplars in eastern plantation woodland. With immature lirellae and so cannot be named to species.
<i>Parmelia sulcata</i>	Frequent on trunks and larger branches of mature Hawthorn, Ash, Hybrid Black Poplar, Sycamore and Willows (<i>Salix caprea</i> & <i>S. fragilis</i>) in scrub and plantation woodlands. Often associated with lichens <i>Melanelia subaurifera</i> , <i>Phaeophyscia orbicularis</i> .
<i>Parmotrema perlatum</i>	Rare on well illuminated upper branches of naturalized mature Hawthorn in scrub and Hawthorns naturalized with the eastern plantation woodland (particularly where sheltered and more humid). Associated with <i>Ramolina</i> species and once with <i>Flavoparmelia caperata</i> .
<i>Peltigera rufescens</i>	Locally abundant within patches of “heathy vegetation”, short (<10cm) open vegetation on dark peaty substrate (often acidic with small black fragments of fly ash still present) particularly where the surface has been disturbed and associated with short disturbed rabbit-grazed grassland of paths and old tracks. Associated with lichen <i>Cladonia furcata</i> ssp. <i>furcata</i> and mosses <i>Dicranum scoparium</i> , <i>Polytrichum juniperinum</i> . With upturned margins to thalli & frequent dark brown (broad) apothecia.

<i>Phaeophyscia orbicularis</i>	Common on shaded trunks and upper branches of mature Hawthorn, Elder, Sycamore, Ash, Hybrid Black Poplar and Willows (<i>Salix caprea</i> & <i>S. fragilis</i>) in scrub and plantation woodlands, occasionally on exposed sand stones.
<i>Phaeophyscia nigricans</i>	Occasional patches on well illuminated exposed calcareous stones (mostly limestone) in open areas (mostly open heathy areas) towards the n. part of the site, associated with <i>Verrucaria nigrescens</i> and <i>Caloplaca citrina</i> .
<i>Phlyctis argena</i>	Rare on lower trunks of mature Hawthorn in Elder & Hawthorn scrub.
<i>Physcia aipolia</i>	Rare, seen once on branches of naturalized mature elder in scrub at TF 1038 0672 (sheltered and humid location) towards the centre of the site. Apothecia common [Medulla K+ yellow]
<i>Physcia adscendens</i>	Very common on twigs and smaller branches of many tree species in scrub and plantation woodlands, occasionally on exposed sand stones at ground level in open "heathy" vegetation.
<i>Physcia caesia</i>	Local on exposed natural well illuminated (and often nutrient enriched) stones in sheltered open areas of short vegetation.
<i>Physconia grisea</i>	Rare (although locally frequent) on upper branches of naturalized mature Elder in scrub (particularly where sheltered and more humid). Associated with Ramolina species, <i>Phaeophyscia orbicularis</i> and once with <i>Parmotrema perlatum</i> .
<i>Protoblastenia rupestris</i>	Rare on well illuminated exposed calcareous stones (mostly limestone) in open areas (mostly open heathy areas) towards the n. part of the site, associated with <i>Verrucaria nigrescens</i> . With apothecia.

<i>Punctelia subrudecta</i>	Frequent on trunks and larger branches of mature Hawthorn, Ash, Hybrid Black Poplar and Willows (<i>Salix caprea</i> & <i>S. fragilis</i>) in scrub and plantation woodland. Often associated with lichens <i>Melanelia subaurifera</i> , <i>Parmelia sulcata</i> and mosses <i>Orthotrichum affine</i> , <i>O. diaphanum</i> . [Thalli C+ and with characteristic “dot-like” pseudocyphellae]
<i>Ramolina farinacea</i>	Occasional on well illuminated branches of Crack Willow in close proximity to eastern plantation woodland (TF1065 0681) and on upper well illuminated branches of mature Hawthorn in scrub (particularly where sheltered, humid and recently coppiced). All thalli seen are small (<2cm in length) or minute. [only plants with farinose soralia along branch margins have been named]
<i>Ramolina fastigiata</i>	Rare on upper well illuminated branches of mature Hawthorn in scrub (particularly where sheltered, humid and recently coppiced). Thalli usually well grown (to 4cm in length) and seen twice with mature apothecia.
<i>Verrucaria nigrescens</i>	Local on well illuminated exposed calcareous stones (mostly limestone) in open areas (mostly open heathy areas) towards the n. part of the site.
<i>Xanthoria parietina</i>	Very common on trunks, smaller twigs and branches of many tree species in scrub and plantation woodlands, occasionally on dead wood (including old railway sleepers) and on exposed nutrient enriched stones and rubble.
<i>Xanthoria polycarpa</i>	Rare on smaller well illuminated twigs of Hawthorn in Elder & Hawthorn scrub.

Noteworthy species

The following 2 species occurring at Bainton Heath are considered noteworthy in a local context.

Leafy liverwort *Cephaloziella sp.*

Several non fertile patches of a species of this Genus of tiny leafy liverworts occurs in small quantity on the shaded side of a rotten railway sleeper at ground level within the main area of heathy vegetation (TF1061 0687). It has frequent red gemmae on the shoot tips but unfortunately is not fertile (lacking perianths) and so cannot be named to species level.

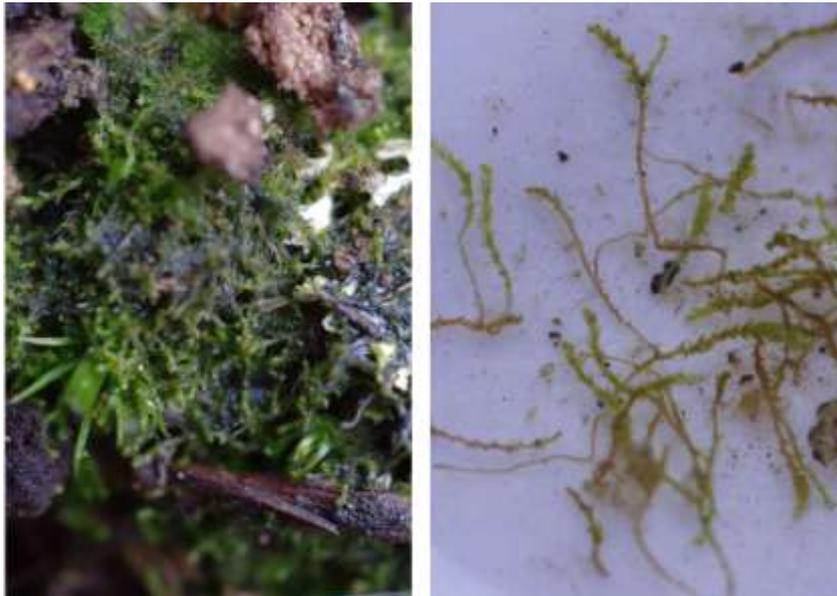


Photo 14 (left) *Cephaloziella sp.* on edge of rotting railway sleeper, n. part of site (red gemmae visible on shoot tips)
(right) close up of individual collected *Cephaloziella* shoots.

Cephaloziella species are generally plants of acid, peaty habitats and away from the Norfolk and Suffolk heaths, are rare in eastern England (particularly within the wider Peterborough area). It is very probable that this species will turn out to be either *Cephaloziella divaricata* or *C. rubella*. *Cephaloziella rubella* is not recorded from the old vice County of Northamptonshire (v.c. 32) within which Bainton Heath is situated and so if confirmed, would be a new vice county record.

Lichen *Cladonia furcata ssp. furcata*

The lichen *Cladonia furcata ssp. furcata* is locally abundant within a number of patches of “heathy” vegetation within Bainton Heath and is associated with the calcifuges mosses *Dicranum scoparium*, *Polytrichum juniperinum*.



Photo 15 (left) *Cladonia furcata* ssp. *furcata*, area of heathy vegetation, s. part of site
(right) specimen of *Cladonia furcata* ssp. *furcata* with apothecia (specimen collected from the n. part of the site)

This species most typically occurs in acid, peaty habitats and has a similar distribution to that of *Cephaloziella* species in eastern England. It is uncommon away from the Norfolk and Suffolk heaths and is a rare species within the wider Peterborough area and confined to small patches on old railway ballast (pers. observations of the author). Of particular note is that at Bainton Heath plants are, in places, particularly well grown and occasionally fertile (with brown apothecia).

Conclusions

Seven broad habitats have been identified that support bryophytes and lichens at Bainton Heath. These are planted trees (plantation woodlands and boundary hedges), scrub, heathy vegetation, tall grassland, short (rabbit grazed) grassland, pools & northern boundary drain, and miscellaneous artificial habitats (surface natural stones, old wooden railway sleepers, brick and concrete rubble). From these 7 habitats, a total of 45 bryophytes (7 liverworts & 38 mosses) and 40 lichens have been identified.

The most important habitats for bryophytes and lichens at Bainton Heath are planted trees (plantation woodlands and boundary hedges), scrub and heathy vegetation. Heathy vegetation supports locally uncommon calcifuge species including the mosses *Dicranum scoparium*, *Polytrichum juniperinum*, a species of the liverwort Genus *Cephaloziella* and lichens *Cladonia furcata ssp. furcata*, *Peltigera rufescens*.

Planted trees (plantation woodlands and boundary hedges) and scrub support a broad range of epiphytic bryophytes and lichens including many species that were previously rare in eastern England and are now beginning to spread with cleaner air and reducing levels of Sulphur Dioxide. These include the mosses *Cryphaea heteromalla*, *Orthotrichum pulchellum*, *Orthotrichum lyellii* and lichens *Parmotrema perlatum*, *Flavoparmelia caperata*, *Ramalina fastigiata*.

The remaining habitats identified of tall grassland, short (rabbit grazed) grassland, pools & northern boundary drain, and miscellaneous artificial habitats (surface natural stones, old wooden railway sleepers, brick and concrete rubble) are less important supporting either low numbers of bryophytes and lichens, or in the case of short (rabbit grazed) grassland, a moderate number of generally common and “weedy” species.

Two species, a species of the liverwort Genus *Cephaloziella* and the lichen *Cladonia furcata ssp. furcata* (both species associated with areas of heathy vegetation) at Bainton Heath are additionally considered to be noteworthy as being scarce in eastern England (and particularly within the wider Peterborough area).

Management Recommendations

The following are general management recommendations for bryophytes and lichens occurring within broad habitats identified as occurring at Bainton Heath:

1. Preserve important short and open areas of vegetation (short grassland and especially areas of heathy vegetation dominated by the lichen *Cladonia furcata*) by cutting (if local rabbit and deer grazing becomes insufficient). Similarly prevent encroachment of the tall grass *Calamagrostis epigejos* into these short areas of vegetation by cutting.
2. Conserve natural surface stones (limestone and sandstone) for bryophytes and particularly saxicolous lichens. Control tall grassland or scrub within close proximity of these stones to increase light levels particularly for lichens.

3. Maintain a good age range of trees across the site for epiphytic bryophytes and lichens. This is particularly important for Elder & Hawthorn scrub which should be coppiced in sections as part of a 10 year cycle. This should then provide the variation in structural form and light levels necessary to allow further development of the epiphytic bryophytes and lichen communities.

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