

Wyre Forest Flushes: A Botanical Study in Shelf Held Coppice

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Introduction

Flushes, springs and seepages are common throughout the Wyre Forest but not much is known about the life in this environment although the habitat has potential to support specialised and often little known species. The Wyre Forest Study Group first became interested in the flushes, springs and seepages of Wyre over a decade ago with various studies on the botanical and invertebrate communities of the habitats being undertaken over the years. Spring-fed seepages tend to be relatively nutrient rich in comparison to the adjoining land through which they pass, because they have accumulated nutrients leached down through the bedrock: the seepage habitat therefore supports different plant and invertebrate communities to those habitats surrounding it. John Bingham recorded the vegetation in wet flushes in July 2008 (unpublished) and also mentioned some of the plants of the wet flushes in his article Wyre Forest and A Vascular Plant Red List for England (Bingham 2015). Mick Blythe has recorded a population of the Nationally Endangered crane fly *Ellipteroides alboscuteatus* and other calcicole flies in a tufa flush in Shelf Held Coppice (Blythe 2010). Susan Limbrey determined soil pH through a series of flushes in Lords Yard and Shelf Held coppices and found a layer of tufa in one of the flushes (Limbrey 2010).

In 2018 the Wyre Forest Study Group decided to progress with the project with Ann Hill recording the

botanical communities, Susan Limbrey investigating the geology, soil and water pH; Mick Blythe recording the associated flies (Diptera), in particular the crane fly *Ellipteroides alboscuteatus*; and Rosemary Winnall recording the molluscs. The aim of the 2018 study was to improve our knowledge of the vegetation communities and associated fauna found in the flushes, springs and seepages of the Wyre Forest. This article describes the results of the botanical survey.

Site

The study was located within Shelf Held Coppice, Wyre Forest and is centered on Grid Reference SO 7531 7516, hereafter referred to as the "Site". The Site was chosen because the Wyre Forest Study Group already had already collected some data for the area (Blythe 2010; Limbrey 2010). The Site was a concave flushed slope with very small seepages breaking out along the incline beneath the sandstone shelves and flowing downhill towards Park Brook. The seepages were characterised by slow rates of flow, and by being extremely shallow, with often no more than a film of water over the substrate. There were no boundaries to the Site and as such it is difficult to give a size to the study area. However, it was approximately 116m long by 35m wide and covered an area of approximately 2944m². The slope was north-west facing with steepness of slope varied between 7 and 18 degrees. The Site was approximately 70-75m above ordnance

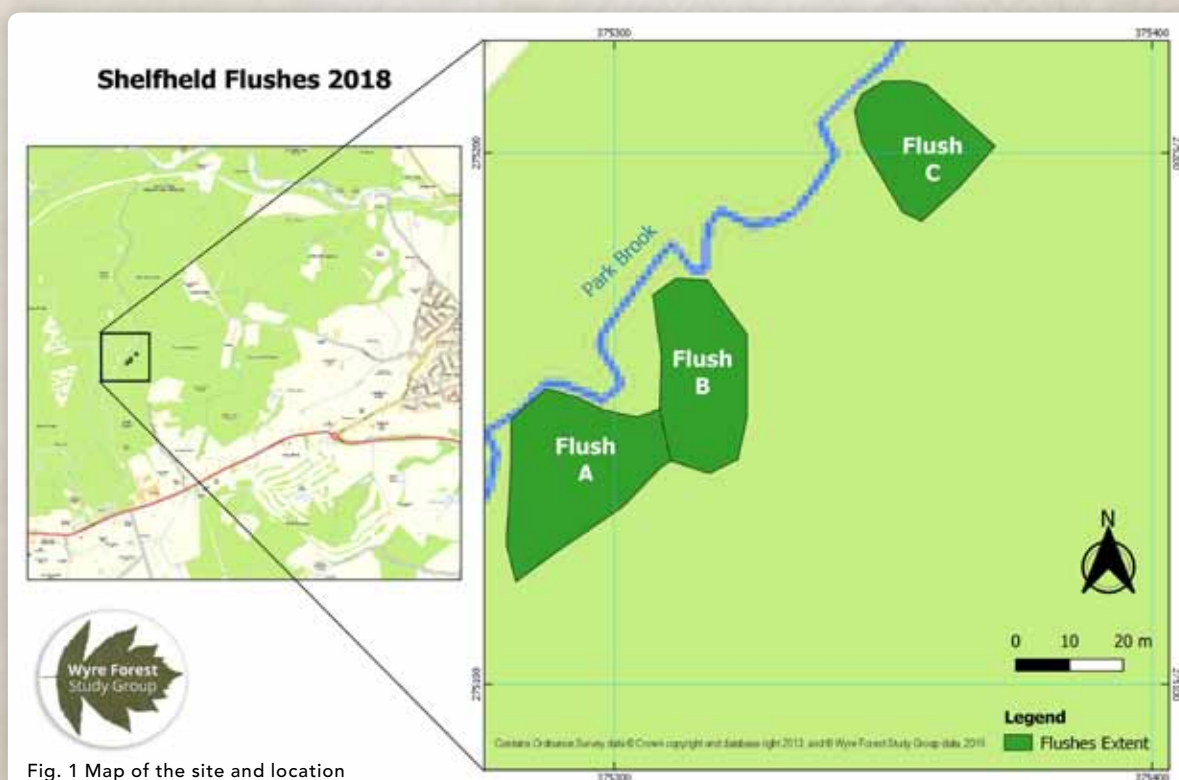


Fig. 1 Map of the site and location

datum. The surrounding habitat was of woodland. *Quercus* sp. oak was abundant in the canopy at the top of the slope with frequent *Betula* sp. birch over *Rubus fruticosus* Bramble, grasses, bracken, ferns and ericoid shrubs. Associated ground flora included *Agrostis capillaris* Common Bent, *Geranium robertianum* Herb-Robert and *Holcus mollis* Creeping Soft-grass. *Alnus glutinosa* Alder canopy was present on the lower slope alongside Park Brook.

Method

The botanical survey was undertaken on 17th and 20th July 2018. Another visit was made on 21st September 2018 to record additional information.

Botanical sampling followed standard phytosociological procedures, as outlined by Rodwell (1991a, 1991b, 2006). The slope was treated as a more-or-less homogeneous area. Three line transects were taken from the top of the slope to the bottom of the slope following as best as possible the water channel. Each transect started upslope at the point where the water was first visible (Transects A and B) or at top of flushed area (Transect C). Five 2m x 2m quadrats were more-or-less equally spaced along each of the three line transects; leaving gaps between the positions. Each quadrat was centered on the water channel and its position marked with a pole. The survey was undertaken with few assumptions about the composition of plant communities.

All vascular plants and bryophytes rooted or attached within the quadrat were accurately identified and listed. For every species recorded in the quadrat, an estimate was made of its quantitative contribution to the vegetation and recorded using the Domin Scale of abundance cover (10 = over 90% cover; 9 = 76-90%; 8 = 51-75%; 7 = 34- 50%; 6 = 26-33%; 5 = 11-25%; 4 = 4-10%; 3 = less than 4% with many individuals; 2 = less than 4% with several individuals; 1 = less than 4% with few individuals). Cover was defined as the proportion of ground occupied by perpendicular projection on to it of the live aerial parts of individuals of the species under consideration in the sampling unit. In addition, observations on the character of the habitat from which the quadrat was taken were made. Most species of vascular plant, moss and liverwort 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. Plant species were identified carefully, but at any time of year some species will be indeterminable because they are not in flower. Vernal herbs and spring ephemerals are likely to have died

back by the July and hence may be under-recorded or missed altogether.

The data collected in the survey were used to describe the plant communities using the National Vegetation Classification (NVC.) The NVC has been adopted by Natural England as the main system for classifying plant communities. The NVC is a phytosociological classification that groups species according to the presence and quantity of trees, shrubs, vascular herbs and ferns, bryophytes and lichens.

MATCH Version 4 (Thomson 2004) was used as a guide to identification of the NVC sub-community groups. MATCH statistically compares the sample data with the diagnostic NVC data held in the computer. MATCH defaults were set to indicate the ten best matches between the NVC data base and a) individual samples and b) combined samples data, in the form of coefficients of similarity. Coefficients of similarity and a list of the diagnoses that are most similar to the collected sample data are displayed, together with the value of the coefficient. A score of 100% indicates a perfect match.

Final diagnosis of NVC groups was confirmed by and depended on the use of Rodwell (Rodwell 1991a, 1991b), using the keys and the NVC community and sub-community descriptions and tables. Some of the differences in scores shown between the top ten matches of groups of closely related vegetation types were very small and use of Rodwell did not always produced unequivocal identifications. The difficulties of precise identification of NVC groups in this instance must be carried in mind when interpreting these results. The text follows the usual phytosociological convention of referring to species of frequency classes IV and V in a particular community as constants; those species of Class III as frequent; of Class II as occasional and of Class I as scarce.

An attempt to draw indications on the influence of each main environmental factor in determining flora and vegetation habitats was made with the help of species attributes (Hill, Preston, Roy 2004; Hill, Preston, Bosanquet et al 2007). For each quadrat, a weighted average was calculated for each of the species attributes, using abundance dominance of each species as the weighting factor.

Nomenclature was as follows: Vascular plants: scientific names following Stace (2010); Bryophytes: follows the latest British Bryological Society Census Catalogue (Hill, Blackstock, Long et al 2008) and the English Names for Common Bryophytes (Edwards 2012); and Vegetation communities follows Rodwell (1991a, 1991b).

Table 1: Plant species recorded in flushes, springs and seepages in Shelf Held Coppice, Wyre during a botanical survey in July 2018.

Species Name	Common Name
<i>Agrostis stolonifera</i>	Creeping Bent
<i>Ajuga reptans</i>	Bugle
<i>Alnus glutinosa</i>	Alder
<i>Amblystegium serpens</i>	Creeping Feather-moss
<i>Anemone nemorosa</i>	Wood Anemone
<i>Angelica sylvestris</i>	Wild Angelica
<i>Athyrium filix-femina</i>	Lady-fern
<i>Blechnum spicant</i>	Hard-fern
<i>Brachypodium sylvaticum</i>	False-brome
<i>Brachythecium rivulare</i>	River Feather-moss
<i>Bromus ramosus</i>	Hairy-brome
<i>Calliergonella cuspidata</i>	Pointed Spear-moss
<i>Carex flacca</i>	Glaucous Sedge
<i>Carex nigra</i>	Common Sedge
<i>Carex pendula</i>	Pendulous Sedge
<i>Carex pulicaris</i>	Flea Sedge
<i>Carex remota</i>	Remote Sedge
<i>Cirriophyllum piliferum</i>	Hair-pointed Feather-moss
<i>Cirsium palustre</i>	Marsh Thistle
<i>Deschampsia cespitosa</i>	Tufted Hair-grass
<i>Dryopteris filix-mas</i>	Male-fern
<i>Equisetum arvense</i>	Field Horsetail
<i>Euphorbia amygdaloides</i>	Wood Spurge
<i>Eurhynchium striatum</i>	Common Striated Feather-moss
<i>Festuca rubra</i>	Red Fescue
<i>Filipendula ulmaria</i>	Meadowsweet
<i>Fissidens adianthoides</i>	Maidenhair Pocket-moss
<i>Fissidens taxifolius</i> var. <i>taxifolius</i>	Common Pocket-moss
<i>Fraxinus excelsior</i>	Ash
<i>Galium palustre</i>	Marsh-bedstraw
<i>Geranium robertianum</i>	Herb-Robert
<i>Hedera helix</i>	Common Ivy
<i>Holcus mollis</i>	Creeping Soft-grass
<i>Hookeria lucens</i>	Shining Hookeria
<i>Hygroamblystegium varium</i>	Willow Feather-moss
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>	Cypress-leaved Plait-moss
<i>Ilex aquifolium</i>	Holly
<i>Juncus articulatus</i>	Jointed Rush
<i>Juncus conglomeratus</i>	Compact Rush
<i>Juncus effusus</i>	Soft-rush
<i>Kindbergia praelonga</i>	Common Feather-moss
<i>Lonicera periclymenum</i>	Honeysuckle
<i>Lophocolea bidentata</i>	Bifid Crestwort
<i>Lotus pedunculatus</i>	Greater Bird's-foot-trefoil
<i>Lysimachia nemorum</i>	Yellow Pimpernel
<i>Melica uniflora</i>	Wood Melick
<i>Mentha aquatica</i>	Water Mint
<i>Molinia caerulea</i>	Purple Moor-grass
<i>Oxalis acetosella</i>	Wood-sorrel
<i>Oxyrrhynchium hians</i>	Swartz's Feather-moss
<i>Palustriella commutata</i>	Curled Hook-moss
<i>Pellia endiviifolia</i>	Endive Pellia
<i>Pimpinella major</i>	Greater Burnet-saxifrage
<i>Plagiomnium undulatum</i>	Hart's-tongue Thyme-moss
<i>Polystichum setiferum</i>	Soft Shield-fern
<i>Primula vulgaris</i>	Primrose
<i>Pseudoscleropodium purum</i>	Neat Feather-moss
<i>Pteridium aquilinum</i>	Bracken
<i>Quercus</i> sp.	Oak sp.
<i>Rubus fruticosus</i> agg.	Bramble
<i>Scapania nemorea</i>	Grove Earwort
<i>Scutellaria minor</i>	Lesser Skullcap
<i>Sonchus asper</i>	Prickly Sow-thistle
<i>Sorbus torminalis</i>	Wild Service-tree
<i>Sphagnum subnitens</i> var. <i>subnitens</i>	Lustrous Bog-moss
<i>Stachys officinalis</i>	Betony
<i>Stachys palustris</i>	Marsh Woundwort
<i>Taraxacum officinale</i> agg.	Dandelion
<i>Teucrium scorodonia</i>	Wood Sage
<i>Thamnobryum alopecurum</i>	Fox-tail Feather-moss
<i>Thuidium tamariscinum</i>	Common Tamarisk-moss
<i>Trichocolea tomentella</i>	Handsome Woollywort
<i>Vaccinium myrtillus</i>	Bilberry
<i>Valeriana dioica</i>	Marsh Valerian
<i>Veronica officinalis</i>	Heath Speedwell
<i>Veronica scutellata</i>	Marsh Speedwell
<i>Viola riviniana</i>	Common Dog-violet

Results

Species

There were a total of 77 plant species recorded during the survey: 58 vascular plants, 15 mosses and four liverworts, Table 1.

No species was recorded in every quadrat but *Molinia caerulea* Purple Moor-grass, a tussock-forming perennial grass, was recorded in fourteen out of fifteen samples and *Rubus fruticosus* bramble and the common moss *Calliergonella cuspidata* Pointed Spear-moss were recorded in eleven out of fifteen samples. 33% of species (26 species) were recorded in only one sample.

Two plants, *Valeriana dioica* Marsh Valerian and *Veronica scutellata* Marsh Speedwell, are on the Vascular Plant Red List for England (Stroh, Leach, Walker et al, 2014). *Valeriana dioica* is a perennial herb of calcareous mires, marshy grassland, water-meadows, flushes, *Salix* fen-carr and *Alnus* woods. It was recorded in six of the fifteen samples. *Veronica scutellata* was recorded in one sample. This perennial herb is found in a wide range of wetland habitats, including pond and lake margins, marshes, fens and fen-meadows, wet grassland, hillside flushes, bogs and wet heath, often on acidic soils. It occurs in both open habitats and amongst tall vegetation. No notable bryophytes were found.

Transect A

The length of Transect A was approximately 21.5m in length. The small spring at the top of Transect A had a cover of bryophytes and scattered flowering plants. A narrow shallow channel with running water flowed down the slope. The plants recorded along Transect A had a wide-range of habitat attributes (Hill, Preston, Roy 2004; Hill, Preston, Bosanquet, Roy 2007). The adjacent woodland canopy gave semi-shade. The habitat had between damp and moist ground conditions. The soils ranged from moderately acid on the upper to mid-slopes and basic towards the bottom of the slope. Measured soil pH was acid to neutral with a range between 5.0 and 6.9 (Limbrey 2010). Measured water pH was 7.9, 8.5 and 8.2 (Limbrey 2018). Plant species that indicated particular environmental conditions along Transect A are listed below:

- Wet site indicators: *Carex remota*, *Filipendula ulmaria*, *Galium palustre*, *Mentha aquatica*, *Molinia caerulea*, *Veronica scutellata* and the mosses *Hygroamblystegium varium*, *Palustriella commutata* and *Trichocolea tomentella*;
- High pH indicators: *Palustriella commutata*;

- Low pH indicator: *Vaccinium myrtillus*; and
- Infertile sites: *Molinia caerulea*, *Vaccinium myrtillus* and the bryophytes *Fissidens adianthoides*, *Palustriella commutata* and *Scapania nemorea*.

There were a total of 54 plants: 34 vascular plants, 16 mosses and 4 liverworts recorded growing in two NVC plant sub-communities M36 (W10c) and M36 (W7b) along Transect A.

Transect B

The length of Transect B was approximately 29m. The underground water emerged at the surface at the top of the slope and flowed into a narrow defined channel down slope. The vascular plants and bryophytes recorded along Transect B had a wide-range of habitat attributes (Hill, Preston, Roy 2004; Hill, Preston, Bosanquet, Roy 2007). Light intensity varied between shade and light: samples were taken in 50% light and 50% closed canopy conditions, with the central slope being more open and invaded by *Alnus glutinosa* saplings. The habitat had between dry and water-saturated badly-aerated ground conditions. The soil attributes ranged from moderately acid towards basic/high pH soils. Measured soil pH was acid to alkaline with a range between 5.0 and 8.25 (Limbrey 2010). The measured water pH were 8.1, 8.4 and 8.4 (Limbrey 2018). There was a scatter of tufa fragments in the top soil and near the seepage at the top of the flush. Tufa was recorded in QB1, QB2 and QB3. Plant species that indicated particular environmental conditions along Transect B were:

- Wet site indicators: *Alnus glutinosa*, *Angelica sylvestris*, *Cirsium palustre*, *Filipendula ulmaria*, *Galium palustre*, *Juncus articulatus*, *Mentha aquatic*, *Molinia caerulea*, *Stachys palustris*, *Valeriana dioica*, *Veronica officinalis* and the bryophytes *Palustriella commutata*, *Pellia endiviifolia*, *Sphagnum subnitens* var. *subnitens*, *Trichocolea tomentella*;
- Light loving plants: *Carex pulicaris*, *Juncus articulatus* and *Valeriana dioica*;
- High pH indicators: *Palustriella commutata*;
- Low pH indicator: *Blechnum spicant*, *Holcus mollis*, *Molinia caerulea*, *Pteridium aquilinum*, *Vaccinium myrtillus* and the moss *Sphagnum subnitens* var. *subnitens*; and
- Infertile sites: *Carex flacca*, *C. pulicaris*, *Juncus articulatus*, *Molinia caerulea*, *Palustriella commutata*, *Sphagnum subnitens* var. *subnitens* and *Vaccinium myrtillus*.

There were a total of 52 plants: 40 vascular plants, 9 mosses and 3 liverworts recorded growing in four NVC

plant sub-communities M36 (W10c), M36 (W7b), M26a and M25c along Transect B.

Transect C

The length of Transect C was approximately 15.5m. Transect C was in an area where the flow of ground water onto the surface was more diffuse and where water flowed widely over the surface of saturated ground rather than in a well-defined channel. The flush had a complete and dense cover of bulky grasses, sedges and rushes with the bryophytes forming a ground layer under this canopy. A large percentage of the sward was flattened (most likely by deer). There was frequent fallen trees and branches.

The plants recorded along Transect C had a range of habitat attributes (Hill, Preston, Roy 2004; Hill, Preston, Bosanquet, Roy 2007). Semi-shade and well-lit habitats (open canopy 70%: closed canopy 30%), between well-drained terrestrial substrate and waterlogged habitats. The soil attributes ranged from acid to basic pH and infertile to richly fertile ground. Measured soil pH was acid to neutral with a range between 4.8 and 7.0 (Limbrey 2010). Plant species that indicated particular environmental conditions along Transect C were:

- Moisture loving plants: *Alnus glutinosa*, *Carex remota*, *Filipendula ulmaria*, *Galium palustre*, *Juncus articulatus*, *Lotus pedunculatus*, *Molinia caerulea*, *Scutellaria minor*, *Valeriana dioica*;
- Light loving plants: *Juncus articulatus*, *Valeriana dioica*;
- Low pH indicator: *Molinia caerulea*, *Pteridium aquilinum*; and
- wlnfertile sites: *Carex flacca*, *C. nigra*, *Juncus articulatus*, *Molinia caerulea*, *Scutellaria minor*.

Transect C was the least species-rich of the three transects: there were a total of 33 plants: 31 vascular plants, 2 mosses and 0 liverworts recorded growing in one NVC plant sub-communities M27c.

Plant Communities

Five plant communities were identified: M36 mire (W10c) (4 quadrats), M36 mire (W7b) (3 quadrats), M26a mire (2 quadrats), M25c (1 quadrat) and M27c mire (5 quadrats). All samples had a low fit to the NVC diagnostic data. The individual samples were analysed and sorted into 5 sub-communities, Table 2.

The habitat environmental attributes and number of plant species per phytosociological sub-community are shown in Figure 2 and Figure 3 and referred to in the following text.

Table 2: National Vegetation Classification communities recorded in the Wyre Forest Flushes during July 2018.

Sample	MATCH Analysis		National Vegetation Classification (NVC) Community and coefficient of similarity
	NVC Community	Coefficient	
QA1	W10c	30.9	NVC M36 Lowland springs and stream banks
	W10	26.1	
	W10a	26.0	
	W10c	24.3	
QA2	W10d	24.0	No data
	W10	21.9	
	W10c	21.7	
	W10b	21.6	
QA3	W5c	18.1	NVC 10c <i>Quercus robur</i> - <i>Pteridium aquilinum</i> - <i>Rubus fruticosus</i> woodland, <i>Hedera helix</i> sub-community
	W10c	26.6	
	W10	25.0	
	W10a	24.9	
QB1	W8c	23.4	NVC M36 Lowland springs and stream banks
	W7c	23.3	
	W7	22.9	
	W7b	22.8	
QA4	W7	20.4	W7b <i>Alnus glutinosa</i> - <i>Fraxinus excelsior</i> - <i>Lysimachia nemorum</i> woodland, <i>Carex remota</i> - <i>Cirsium palustre</i> sub-community
	W7c	14.5	
	W7c	23.9	
	W9	23.7	
QB5	W8c	22.8	W7b, coefficient = 35.1
	M26a	26.4	
	M27c	24.9	
	M26	24.8	
QB2	M26a	22.8	M26a <i>Molinia caerulea</i>-<i>Crepis paludosa</i> mire, <i>Sanguisorba officinalis</i> sub-community
	M26	21.4	
	M9	21.0	
	M25c	27.8	
QB4	W7	27.3	M25c <i>Molinia caerulea</i>-<i>Potentilla erecta</i> mire, <i>Angelica sylvestris</i> sub-community
	W7b	26.7	
	M27c	33.4	
	M23b	31.9	
QC1	M23	28.7	M27c <i>Filipendula ulmaria</i>-<i>Angelica sylvestris</i> mire, <i>Juncus effusus</i>-<i>Holcus lanatus</i> sub-community
	M27c	36.0	
	M26a	29.4	
	M26	28.2	
QC2	M23b	29.8	M27c, coefficient = 32.2
	M27c	29.0	
	M23	28.4	
	M27c	27.9	
QC3	M23	22.8	M23b <i>Juncus effusus</i>-<i>acutiflorus</i>-<i>Galium palustre</i> rush-pasture, <i>Juncus effusus</i> sub-community
	M26a	22.1	
	M27c	25.1	
	W10c	24.5	
QC5	W9	23.4	M23b, coefficient = 31.9



Ann Hill on Transect A

Rosemary Winnall

M36 Lowland springs and streambanks of shaded situations / W10 *Quercus robur*-*Pteridium aquilinum*-*Rubus fruticosus* woodland, *Hedera helix* sub-community

NVC M36 mire vegetation community (Samples QA1, QA2, QA3 and QB1) was found on soils on the upper slope of the flush surrounding a narrow damp/wet seepage line. Tufa deposits were present in the channel below the spring head (sample QB1). The M36 mire vegetation community was in semi-shade and was overhung in part by a mature oak canopy. Woody seedlings were present in the ground flora. There is no data for the M36 phytosociological community in

the NVC but the community has a resemblance to the ground flora of NVC W10c *Quercus robur*-*Pteridium aquilinum*-*Rubus fruticosus* woodland, *Hedera helix* sub-community. The following numbers of species per sample were recorded:

	Mean	Min	Max
Wyre Forest Fushes samples	20.8	16	24
NVC W10c	16.0	7	23

There were a total of 46 plant species recorded in the samples: 31 vascular plants, 13 mosses and 2 liverworts, Table 3.

The NVC M36 mire vegetation community had eleven



Figure 2: Habitat environmental attributes for five plant communities found growing in three transects in flushes of the Wyre Forest. Plant data collected in July 2018.

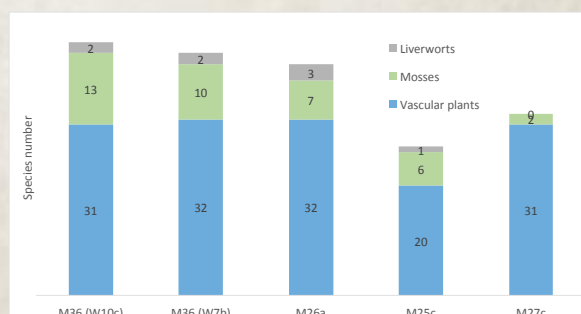


Figure 3: Number of plant species recorded in five plant communities in flushes of the Wyre Forest. Plant data collected July 2018.

Table 3: Vascular plants, mosses and liverworts recorded growing in four 2m x 2m quadrats (QA1, QA2, QA3 and QB1) in flushes of the Wyre Forest during July 2018.

Species Name	Common Name	Frequency & Abundance Values
<i>Calliergonella cuspidata</i>	Pointed Spear-moss	constant (1-3)
<i>Euphorbia amygdaloides</i>	Wood Spurge	constant (1-1)
<i>Fraxinus excelsior</i> sapling	Ash sapling	constant (1-1)
<i>Lonicera periclymenum</i> seedling	Honeysuckle seedling	constant (2-3)
<i>Molinia caerulea</i>	Purple Moor-grass	constant (2-7)
<i>Polystichum setiferum</i>	Soft Shield-fern	constant (1-1)
<i>Pteridium aquilinum</i>	Bracken	constant (1-4)
<i>Rubus fruticosus</i> agg.	Bramble	constant (2-4)
<i>Thamnobryum alopecurum</i>	Fox-tail Feather-moss	constant (1-6)
<i>Thuidium tamariscinum</i>	Common Tamarisk-moss	constant (1-3)
<i>Viola riviniana</i>	Common Dog-violet	constant (1-2)
<i>Carex remota</i>	Remote Sedge	common/frequent (2-4)
<i>Equisetum arvense</i>	Field Horsetail	common/frequent (1-2)
<i>Fissidens taxifolius</i>	Common Pocket-moss	common/frequent (2-2)
<i>Galium palustre</i>	Marsh-bedstraw	common/frequent (3-5)
<i>Geranium robertianum</i>	Herb-Robert	common/frequent (1-1)
<i>Holcus mollis</i>	Creeping Soft-grass	common/frequent (1-3)
<i>Hookeria lucens</i>	Shining Hookeria	common/frequent (2-3)
<i>Hypnum cupressiforme</i>	Cypress-leaved Plait-moss	common/frequent (1-1)
<i>Kindbergia praelonga</i>	Common Feather-moss	common/frequent (2-3)
<i>Palustriella commutata</i>	Curled Hook-moss	common/frequent (2-6)
<i>Trichocolea tomentella</i>	Handsome Woollywort	common/frequent (2-3)
<i>Agrostis stolonifera</i>	Creeping Bent	occasional (3-3)
<i>Amblystegium serpens</i>	Creeping Feather-moss	occasional (1-1)
<i>Anemone nemorosa</i>	Wood Anemone	occasional (1-1)
<i>Blechnum spicant</i>	Hard-fern	occasional (1-1)
<i>Brachypodium sylvaticum</i>	False-brome	occasional (4-4)
<i>Bromus ramosus</i>	Hairy-brome	occasional (1-1)
<i>Carex flacca</i>	Glaucous Sedge	occasional (1-1)
<i>Festuca rubra</i>	Red Fescue	occasional (1-1)
<i>Filipendula ulmaria</i>	Meadowsweet	occasional (1-1)
<i>Fissidens adianthoides</i>	Maidenhair Pocket-moss	occasional (1-1)
<i>Hedera helix</i>	Common Ivy	occasional (1-1)
<i>Ilex aquifolium</i> seedling	Holly seedling	occasional (1-1)
<i>Juncus articulatus</i>	Jointed Rush	occasional (2-2)
<i>Juncus conglomeratus</i>	Compact Rush	occasional (1-1)
<i>Lophocolea bidentata</i>	Bifid Crestwort	occasional (4-4)
<i>Melica uniflora</i>	Wood Melick	occasional (2-2)
<i>Oxyrrhynchium hians</i>	Swartz's Feather-moss	occasional (3-3)
<i>Plagiommium undulatum</i>	Hart's-tongue Thyme-moss	occasional (1-1)
<i>Pseudoscleropodium purum</i>	Neat Feather-moss	occasional (1-1)
<i>Quercus</i> seedling	Oak seedling	occasional (1-1)
<i>Stachys officinalis</i>	Betony	occasional (2-2)
<i>Taraxacum officinale</i> agg.	Dandelion	occasional (1-1)
<i>Vaccinium myrtillus</i>	Bilberry	occasional (4-4)
<i>Veronica officinalis</i>	Heath Speedwell	occasional (1-1)

constant species. The community was characterised by constant tussocks of *Molinia caerulea* Purple Moor-grass and *Rubus fruticosus* Bramble and at low cover *Pteridium aquilinum* Bracken (on drier ground) with scattered individuals of *Euphorbia amygdaloides* Wood Spurge, *Polystichum setiferum* Soft Shield-fern and *Viola riviniana* Common Dog-violet. *Carex remota* Remote Sedge and the perennial herb *Galium palustre* Marsh-bedstraw were locally frequent. Woody regeneration was constant at low cover. The bryophytes *Calliergonella cuspidata* Pointed Spear-moss, *Thamnobryum alopecurum* Fox-tail Feather-moss (a shade-tolerant moss) and *Thuidium tamariscinum* Common Tamarisk-moss were locally frequent under the herbage. In the water channel *Palustriella commutata* Curled Hook-moss, a characteristic moss of calcareous springs, and *Trichocolea tomentella* Handsome Woollywort were locally abundant.

M36 Lowland springs and streambanks of shaded situations / W7b *Alnus glutinosa*-*Fraxinus excelsior*-*Lysimachia nemorum* woodland, *Carex remota*-*Cirsium palustre* sub-community

NVC M36 mire vegetation community (Samples QA4,

QA5 and QB5) was found on moist soils (damper soils than the previous described M36 (W10c) community) at the bottom of the flushed slope. There was an 80% closed canopy of *Alnus glutinosa* alder and *Betula* sp. birch with a ground flora mosaic of herbaceous dicotyledons and grasses related to the wetness and nutrient status of the soil. Bryophytes were locally frequent on the wet mud and silt. Fallen timber and branches were occasional. There was occasional regeneration of woody species within the ground flora. The phytosociological community is not sampled in the NVC but the community has a resemblance to the ground flora of NVC W7 *Alnus glutinosa*-*Fraxinus excelsior*-*Lysimachia nemorum* woodland. The following numbers of species per sample were recorded:

	Mean	Min	Max
Wyre Forest Flushes samples	20.3	18	19
NVC W7b	32.0	19	46

There were a total of 44 plant species recorded in the samples: 32 vascular plants, 10 mosses and 2 liverworts, Table 4.

The community had a mixed rush, sedge and grass sward. There were fifteen constant species. Constant species at a high abundance were *Molinia caerulea* Purple Moor-grass, *Carex remota* Remote Sedge, *Juncus effusus* Soft-rush and the moss *Plagiommium undulatum* Hart's-tongue Thyme-moss. Constant herbaceous species at low cover were *Lysimachia nemorum* Yellow Pimpernel, *Mentha aquatica* Water Mint, *Viola riviniana* Common Dog-violet, *Brachypodium sylvaticum* False-brome, *Filipendula ulmaria* Meadowsweet and patches of *Rubus fruticosus* Bramble on drier soils. A patchy bryophyte cover under the sward included locally frequent *Calliergonella cuspidata* Pointed Spear-moss, *Thamnobryum alopecurum* Fox-tail Feather-moss and *Thuidium tamariscinum* Common Tamarisk-moss. The bryophytes *Trichocolea tomentella* Handsome Woollywort, *Pellia endiviifolia* Endive Pellia and *Palustriella commutata* Curled Hook-moss were indicative of calcareous conditions.

M26a *Molinia caerulea*-*Crepis paludosa* mire, *Sanguisorba officinalis* sub-community

The vegetation in Samples QB2 and QB3 loosely fitted NVC M26a *Molinia caerulea*-*Crepis paludosa* mire, *Sanguisorba officinalis* sub-community. The community was found on flushed slopes with a slow trickle of open running water; in places the channel spread out across the slope with drier mounds in the channel. Calcareous deposits were present on the

Table 4: Vascular plants, mosses and liverworts recorded growing in three 2m x 2m quadrats (QA4, QA5 and QB5) in flushes of the Wyre Forest during July 2018.

Species Name	Common Name	Frequency & Abundance Values
<i>Brachypodium sylvaticum</i>	False-brome	Constant (2-2)
<i>Carex remota</i>	Remote Sedge	Constant (3-6)
<i>Equisetum arvense</i>	Field Horsetail	Constant (1-1)
<i>Filipendula ulmaria</i>	Meadowsweet	Constant (1-2)
<i>Fraxinus excelsior</i> sapling	Ash sapling	Constant (1-2)
<i>Geranium robertianum</i>	Herb-Robert	Constant (1-1)
<i>Juncus effusus</i>	Soft-rush	Constant (1-6)
<i>Lysimachia nemorum</i>	Yellow Pimpernel	Constant (1-2)
<i>Mentha aquatica</i>	Water Mint	Constant (2-2)
<i>Molinia caerulea</i>	Purple Moor-grass	Constant (5-7)
<i>Plagiomnium undulatum</i>	Hart's-tongue Thyme-moss	Constant (1-5)
<i>Primula vulgaris</i>	Primrose	Constant (1-2)
<i>Rubus fruticosus</i> agg.	Bramble	Constant (2-3)
<i>Trichocolea tomentella</i>	Handsome Woollywort	Constant (2-2)
<i>Viola riviniana</i>	Common Dog-violet	Constant (2-2)
<i>Amblystegium serpens</i>	Creeping Feather-moss	Occasional (1-1)
<i>Blechnum spicant</i>	Hard-fern	Occasional (1-1)
<i>Brachythecium rivulare</i>	River Feather-moss	Occasional (1-1)
<i>Bromus ramosus</i>	Hairy-brome	Occasional (2-2)
<i>Calliergonella cuspidata</i>	Pointed Spear-moss	Occasional (3-3)
<i>Carex flacca</i>	Glaucous Sedge	Occasional (1-1)
<i>Carex pendula</i>	Pendulous Sedge	Occasional (1-1)
<i>Deschampsia cespitosa</i>	Tufted Hair-grass	Occasional (1-1)
<i>Eurhynchium striatum</i>	Common Striated Feather-moss	Occasional (2-2)
<i>Fissidens adianthoides</i>	Maidenhair Pocket-moss	Occasional (2-2)
<i>Galium palustre</i>	Marsh-bedstraw	Occasional (4-4)
<i>Hygroamblystegium varium</i>	Willow Feather-moss	Occasional (1-1)
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>	Cypress-leaved Plait-moss	Occasional (1-1)
<i>Juncus articulatus</i>	Jointed Rush	Occasional (3-3)
<i>Lonicera periclymenum</i> seedling	Honeysuckle seedling	Occasional (1-1)
<i>Oxalis acetosella</i>	Wood-sorrel	Occasional (2-2)
<i>Palustriella commutata</i>	Curled Hook-moss	Occasional (2-2)
<i>Pellia endiviifolia</i>	Endive Pellia	Occasional (2-2)
<i>Pimpinella major</i>	Greater Burnet-saxifrage	Occasional (1-1)
<i>Polystichum setiferum</i>	Soft Shield-fern	Occasional (1-1)
<i>Pseudoscleropodium purum</i>	Neat Feather-moss	Occasional (2-2)
<i>Scapania nemorea</i>	Grove Earwort	Occasional (1-1)
<i>Sonchus asper</i>	Prickly Sow-thistle	Occasional (2-2)
<i>Sorbus torminalis</i> seedling	Wild Service-tree seedling	Occasional (1-1)
<i>Stachys palustris</i>	Marsh Woundwort	Occasional (1-1)
<i>Thamnobryum alopecurum</i>	Fox-tail Feather-moss	Occasional (5-5)
<i>Thuidium tamariscinum</i>	Common Tamarisk-moss	Occasional (4-4)
<i>Valeriana dioica</i>	Marsh Valerian	Occasional (2-2)
<i>Veronica scutellata</i>	Marsh Speedwell	Occasional (1-1)

shoots of the pleurocarpous moss growing in the channel. The following numbers of species per sample were recorded:

	Mean	Min	Max
Wyre Forest Fushes samples	23.5	24	24
NVC W26a	26.0	20	32

There were 32 plant species recorded in the samples (alder seedling and alder sapling counted as 1 species): 22 vascular plants, 7 mosses and 3 liverworts, Table 5. There were 14 constant species in the community. The community was characterised by a dense cover of *Molinia caerulea* Purple Moor-grass with patches of *Juncus articulatus* Jointed Rush present at a lower abundance. The shade tolerant moss *Calliergonella cuspidata* Pointed Spear-moss was present at high abundance and frequency under the tall sward. Other constant species found at low abundance included *Sonchus asper* Prickly Sow-thistle, *Agrostis stolonifera* Creeping Bent and the mosses *Thamnobryum alopecurum* Fox-tail Feather-moss and *Plagiomnium undulatum* Hart's-tongue Thyme-moss. Grasses were poorly represented in the sward. The large pleurocarpous moss *Palustriella commutata* Curled Hook-moss, encrusted with calcareous matter below, was locally frequent in the water channel.

M25c *Molinia caerulea*-*Potentilla erecta* mire,

Table 5: Vascular plants, mosses and liverworts recorded growing in two 2m x 2m quadrats (QB2 and QB3) in flushes of the Wyre Forest during July 2018.

Species Name	Common Name	Frequency & Abundance Values
<i>Agrostis stolonifera</i>	Creeping Bent	Constant (1-2)
<i>Calliergonella cuspidata</i>	Pointed Spear-moss	Constant (4-6)
<i>Equisetum arvense</i>	Field Horsetail	Constant (1-2)
<i>Euphorbia amygdaloides</i>	Wood Spurge	Constant (1-2)
<i>Juncus articulatus</i>	Jointed Rush	Constant (1-5)
<i>Lophocolea bidentata</i>	Blind Crestwort	Constant (1-1)
<i>Molinia caerulea</i>	Purple Moor-grass	Constant (4-6)
<i>Palustriella commutata</i>	Curled Hook-moss	Constant (4-4)
<i>Pellia endiviifolia</i>	Endive Pellia	Constant (1-1)
<i>Plagiomnium undulatum</i>	Hart's-tongue Thyme-moss	Constant (2-3)
<i>Sonchus asper</i>	Prickly Sow-thistle	Constant (2-2)
<i>Thamnobryum alopecurum</i>	Fox-tail Feather-moss	Constant (2-4)
<i>Trichocolea tomentella</i>	Handsome Woollywort	Constant (1-2)
<i>Valeriana dioica</i>	Marsh Valerian	Constant (1-2)
<i>Ainus glutinosa</i> sapling	Alder sapling	Common/frequent (1-1)
<i>Ainus glutinosa</i> seedling	Alder seedling	Common/frequent (2-2)
<i>Angelica sylvestris</i>	Wild Angelica	Common/frequent (1-1)
<i>Athyrium filix-femina</i>	Lady-fern	Common/frequent (1-1)
<i>Blechnum spicant</i>	Hard-fern	Common/frequent (1-1)
<i>Carex flacca</i>	Glaucous Sedge	Common/frequent (2-2)
<i>Filipendula ulmaria</i>	Meadowsweet	Common/frequent (1-1)
<i>Galium palustre</i>	Marsh-bedstraw	Common/frequent (2-2)
<i>Holcus mollis</i>	Creeping Soft-grass	Common/frequent (2-2)
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>	Cypress-leaved Plait-moss	Common/frequent (1-1)
<i>Juncus effusus</i>	Soft-rush	Common/frequent (3-3)
<i>Lonicera periclymenum</i> seedling	Honeysuckle seedling	Common/frequent (1-1)
<i>Mentha aquatica</i>	Water Mint	Common/frequent (2-2)
<i>Pteridium aquilinum</i>	Bracken	Common/frequent (1-1)
<i>Rubus fruticosus</i> agg.	Bramble	Common/frequent (1-1)
<i>Sphagnum subnitens</i> var. <i>subnitens</i>	Lustrous Bog-moss	Common/frequent (1-1)
<i>Stachys officinalis</i>	Betony	Common/frequent (1-1)
<i>Thuidium tamariscinum</i>	Common Tamarisk-moss	Common/frequent (1-1)
<i>Vaccinium myrtillus</i>	Bilberry	Common/frequent (1-1)

Angelica sylvestris sub-community

The community in Sample QB4 (only one sample) poorly matched NVC M25c *Molinia caerulea*-*Potentilla erecta* mire, *Angelica sylvestris* sub-community. The sample was recorded on gently-sloping ground within young alder coppice. The water channel was heavily shaded and had slow-flowing water on the date of survey. This was species-poor vegetation with 27 plant species recorded in one sample: 20 vascular plants, 6 mosses and 1 liverwort, Table 6.

The community was overwhelmingly dominated by *Molinia caerulea* Purple Moor-grass with *Thamnobryum alopecurum* Fox-tail Feather-moss and *Plagiomnium undulatum* Hart's-tongue Thyme-moss present under the dense herbage. The associated flora was poor: the most common dicotyledons were *Galium palustre* Marsh-bedstraw and *Valeriana dioica* Marsh Valerian with occasional *Bromus ramosus* Hairy-brome, *Carex flacca* Glaucous Sedge, *Juncus effusus* Soft-rush and *Mentha aquatica* Water Mint. Bryophytes were scarce, and were mainly confined to open areas in the runnels or around tussocks. Hummocks of *Sphagnum subnitens* var. *subnitens* Lustrous Bog-moss were locally frequent on the flushed margins of the stream.

M27c *Filipendula ulmaria*-*Angelica sylvestris* mire, *Juncus effusus*-*Holcus lanatus* sub-community

The community in Samples QC1, QC2, QC3, QC4 and QC5 best matched NVC M27c *Filipendula ulmaria*-*Angelica sylvestris* mire, *Juncus effusus*-*Holcus lanatus* sub-community although there was a resemblance to NVC M23b *Juncus effusus*-*acutiflorus*-*Galium palustre* rush-pasture, *Juncus effusus* sub-community. The

Table 6: Vascular plants, mosses and liverworts recorded growing in one 2m x 2m quadrat (QB4) in flushes of the Wyre Forest during July 2018.

Species Name	Common Name	Frequency & Abundance Values
<i>Molinia caerulea</i>	Purple Moor-grass	Constant (6)
<i>Plagiommium undulatum</i>	Hart's-tongue Thyme-moss	Constant (5)
<i>Thamnobryum alopecurum</i>	Fox-tail Feather-moss	Constant (5)
<i>Galium palustre</i>	Marsh-bedstraw	Common/frequent (3)
<i>Lophocolea bidentata</i>	Bifid Crestwort	Common/frequent (3)
<i>Valeriana dioica</i>	Marsh Valerian	Common/frequent (3)
<i>Bromus ramosus</i>	Hairy-brome	Occasional (2)
<i>Calliergonella cuspidata</i>	Pointed Spear-moss	Occasional (2)
<i>Carex flacca</i>	Glaucous Sedge	Occasional (2)
<i>Juncus effusus</i>	Soft-rush	Occasional (2)
<i>Mentha aquatica</i>	Water Mint	Occasional (2)
<i>Sphagnum subnitens</i> var. <i>subnitens</i>	Lustrous Bog-moss	Occasional (2)
<i>Ajuga reptans</i>	Bugle	Scarce (1)
<i>Alnus glutinosa</i> seedling	Alder seedling	Scarce (1)
<i>Angelica sylvestris</i>	Wild Angelica	Scarce (1)
<i>Carex pulicaris</i>	Flea Sedge	Scarce (1)
<i>Cirriophyllum piliferum</i>	Hair-pointed Feather-moss	Scarce (1)
<i>Cirsium palustre</i>	Marsh Thistle	Scarce (1)
<i>Deschampsia cespitosa</i>	Tufted Hair-grass	Scarce (1)
<i>Euphorbia amygdaloides</i>	Wood Spurge	Scarce (1)
<i>Fraxinus excelsior</i> seedling	Ash seedling	Scarce (1)
<i>Kindbergia praelonga</i>	Common Feather-moss	Scarce (1)
<i>Lysimachia nemorum</i>	Yellow Pimpernel	Scarce (1)
<i>Polystichum setiferum</i>	Soft Shield-fern	Scarce (1)
<i>Primula vulgaris</i>	Primrose	Scarce (1)
<i>Pteridium aquilinum</i>	Bracken	Scarce (1)
<i>Teucrium scorodonia</i>	Wood Sage	Scarce (1)

community grew on tussocky uneven ground under a mainly open canopy. The following numbers of species per sample were recorded:

	Mean	Min	Max
Wyre Forest Fushes samples	14.8	12	19
NVC W27c	15.0	9	22

There were 33 plant species recorded in the samples: 31 vascular plants and 2 mosses, Table 7.

This was a rank sward with a mixture of bulky rushes, grasses and herbaceous plants with six community constants. The community was characterised by constant *Molinia caerulea* Purple Moor-grass, *Juncus articulatus* Jointed Rush and *Juncus effusus* Soft-rush with *Filipendula ulmaria* Meadowsweet was constant in the sward but always at low cover. The frequency and abundance of *Filipendula ulmaria* Meadowsweet in the sward is the critical division between classifying the community as NVC M27c or NVC M23b. *Pteridium aquilinum* Bracken was constantly present at low abundance. The moss *Calliergonella cuspidata* Pointed Spear-moss was locally abundant in open areas of the sward. *Carex flacca* Glaucous Sedge, *C. nigra* Common Sedge, *Lysimachia nemorum* Yellow Pimpernel, *Agrostis stolonifera* Creeping Bent and *Athyrium filix-femina* Lady-fern were frequent. Bryophytes were few in number. The ground layer had occasional regeneration of woody plants.

Discussion

The scale of patterning in the vegetation across the flushed area was a mosaic of awkwardly-shaped and small stands of vegetation along and around the flushes, springs and seepages. *Molinia caerulea*

Table 7: Vascular plants, mosses and liverworts recorded growing in five 2m x 2m quadrats (QC1, QC2, QC3, QC4 and QC5) in flushes of the Wyre Forest during July 2018.

Species Name	Common Name	Frequency & Abundance Values
<i>Calliergonella cuspidata</i>	Pointed Spear-moss	Constant (7-8)
<i>Filipendula ulmaria</i>	Meadowsweet	Constant (1-3)
<i>Juncus articulatus</i>	Jointed Rush	Constant (3-8)
<i>Juncus effusus</i>	Soft-rush	Constant (4-6)
<i>Molinia caerulea</i>	Purple Moor-grass	Constant (6-8)
<i>Pteridium aquilinum</i>	Bracken	Constant (1-2)
<i>Agrostis stolonifera</i>	Creeping Bent	Common/frequent (2-2)
<i>Athyrium filix-femina</i>	Lady-fern	Common/frequent (1-1)
<i>Carex flacca</i>	Glaucous Sedge	Common/frequent (2-2)
<i>Carex nigra</i>	Common Sedge	Common/frequent (2-3)
<i>Lysimachia nemorum</i>	Yellow Pimpernel	Common/frequent (2-2)
<i>Rubus fruticosus</i> agg.	Bramble	Common/frequent (2-2)
<i>Bromus ramosus</i>	Hairy-brome	Occasional (1-1)
<i>Galium palustre</i>	Marsh-bedstraw	Occasional (1-2)
<i>Polystichum setiferum</i>	Soft Shield-fern	Occasional (1-2)
<i>Quercus</i> seedling	Oak seedling	Occasional (1-1)
<i>Sorbus torminalis</i> seedling	Wild Service-tree seedling	Occasional (1-1)
<i>Valeriana dioica</i>	Marsh Valerian	Occasional (2-2)
<i>Viola riviniana</i>	Common Dog-violet	Occasional (2-2)
<i>Alnus glutinosa</i> seedling	Alder seedling	Scarce (1-1)
<i>Carex remota</i>	Remote Sedge	Scarce (1-1)
<i>Deschampsia cespitosa</i>	Tufted Hair-grass	Scarce (6-6)
<i>Dryopteris filix-mas</i>	Male-fern	Scarce (1-1)
<i>Festuca rubra</i>	Red Fescue	Scarce (2-2)
<i>Fraxinus excelsior</i> sapling	Ash sapling	Scarce (1-1)
<i>Geranium robertianum</i>	Herb-Robert	Scarce (1-1)
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>	Cypress-leaved Plait-moss	Scarce (2-2)
<i>Juncus conglomeratus</i>	Compact Rush	Scarce (4-4)
<i>Lonicera periclymenum</i> seedling	Honeysuckle seedling	Scarce (1-1)
<i>Lotus pedunculatus</i>	Greater Bird's-foot-trefoil	Scarce (2-2)
<i>Primula vulgaris</i>	Primrose	Scarce (1-1)
<i>Scutellaria minor</i>	Lesser Skullcap	Scarce (1-1)
<i>Taraxacum officinale</i> agg.	Dandelion	Scarce (1-1)

Purple Moor-grass was constant throughout all plant communities but its dominance and herbaceous associates changed in relation to habitat conditions. The vegetation in Transects A and B looked superficially similar but had subtle differences in their composition. Both were springheads flowing into shallow damp/wet channels on flushed slopes. Transect A had shadier and moister conditions which has resulted in a greater representation of bryophytes in the field layer. Transect B was a calcareous springhead with small amounts of tufa deposits present along the stream channel in mosaic with a more acidic substrate found on in-stream hummocks and the stream banks. Tufa deposits typically supported highly calcicolous species, for example *Palustriella commutata* (where there was likely to be year-round irrigation). Both Transect A and B lines crossed vegetation type boundaries. Transect C was an open seepage dominated by rank grasses, sedges and rushes: this was the most species-poor plant community. Because the hydrological features and their underlying geology were so varied in the three transects, it was difficult to draw conclusions about how particular physical features influenced the development of local phytosociological communities. The flushed slope had numerous water channels, localised at a small scale, some of which are likely to change year on year across slope.

Describing the plant communities was difficult. All the plant communities described by phytosociology shared the problem that vegetation varies in response to many different variables, including degree of moisture, degree of shade, soil chemistry, and so on. Thus the problem is not simply that two communities

may intergrade, but that almost any community can grade into any other, producing variation which is difficult to classify in a simple way. It is likely that flush vegetation is typically more variable than terricolous vascular plant vegetation, as springs and seepages are frequently very uneven and conditions change rapidly over short distances. Under these conditions it is likely that truly homogeneous stands, where all parts of the quadrat experience similar environmental conditions, will be uncommon. In addition, because of the heterogeneity of habitat, species which have little in common ecologically can occur in the same community, though usually at low cover and low frequency. For example, *Vaccinium myrtillus* bilberry, a calcifugous low shrub, occurred in the same quadrat (QB3) as *Palustriella commutata* which is a species indicative of very base-rich conditions.

Although the physiological community NVC M36 Lowland springs and streambanks of shaded situations is recognised as being widely found through lowland Britain there is no nationally recognised diagnostic NVC M36 community data to compare the Wyre Forest sample data with. Flushes, springs and seepages occur across a very wide range of habitats in Britain, and in the past, because of their small size, have often been considered as elements of the wider habitat in which they occur (i.e. woodlands, grasslands). Botanists have for some time recognised that, though they may only represent very small constituents of the total area of a site, they are abundantly distinct in the vegetation that they support, and should be considered as distinct communities in their own right. In practice, seepages within woodland are not differentiated in the NVC from the surrounding woodland vegetation: most likely because vegetation in woodland seepages tends to be poorly defined, and often the level of shade results in no vegetation at all.

All the samples had a low fit to the NVC data. The 2m x 2m quadrat size was chosen to allow comparison with the nationally recognised standards in the NVC. However, bryophytes are strongly influenced by small-scale changes in soils, relief and microclimate, and therefore fine-scale differences in distribution means that they vary widely over spatial scales which are much smaller than those generally encountered within standard 2m x 2m vegetation surveys. The use of nested 50cm x 50cm quadrats within 2m x 2m quadrats would be more appropriate to the range of structural variation found in, and provide a more accurate characterisation of, the Wyre flushes, springs and seepages. Whilst every sample is unique and there is always likely to be difference between the NVC and the Wyre samples, the collection of more samples

would strengthen and give confidence to any results.

During 2018 the Wyre Forest Study Group has increased its knowledge of the flora and fauna of the flushes, springs and seepages of the Wyre Forest. Nevertheless, the Wyre Forest has many many more flushes, springs and seepages that need investigation. These are specialised and localised habitats and they support a fascinating and diverse flora and fauna. This is possibly one of the most neglected habitats in Wyre. An ongoing project!!

References

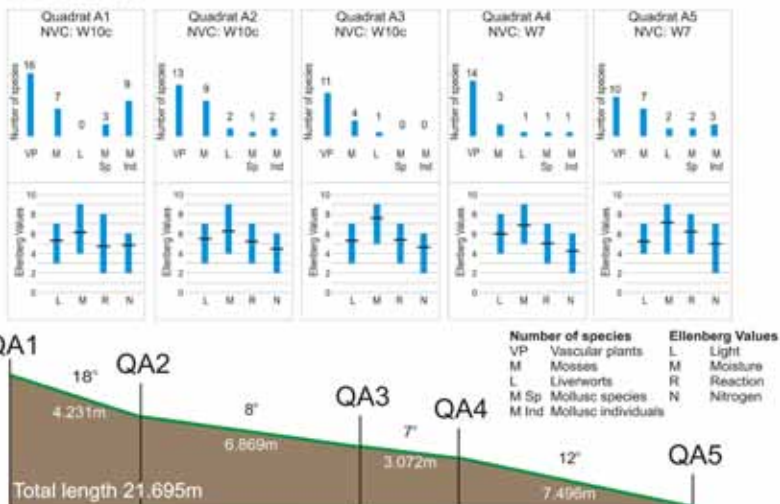
- Bingham, J. (2015). Wyre Forest and A Vascular Plant Red List for England. Wyre Forest Study Group Review 2015, 11-17.
- Blythe, M. (2010). Ellipteroides Craneflies (Diptera: Limoniidae) in the Wyre Forest. Wyre Forest Study Group Review 2010, 34-37.
- Edwards, S.R. (2012). English Names for British Bryophytes: 4th Edition. Northampton: British Bryological Society.
- Hill M.O., Preston C.D., and Roy D.B. (2004). PLANTATT: Attributes of British and Irish Plants. NERC Centre for Ecology and Hydrology.
- 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. L. and Rothero, G.P. (2008). A Checklist and Census Catalogue of British and Irish Bryophytes Updated 2008. British Bryological Society, Middlewich.
- Limbrey, S. (2010). Tufaceous Wet Flushes in the Wyre Forest. Wyre Forest Study Group Review 2010, 40-42.
- Rodwell, J.S. (2006). National Vegetation Classification: Users' Handbook. Joint Nature Conservation Committee, Peterborough.
- Rodwell, J.S. (Editor) (1991a). British Plant Communities - 1. Woodland and Scrub. Cambridge University Press, Cambridge.
- Rodwell, J.S. (Editor) (1991b). British Plant Communities - 2. Mires and Heaths. Cambridge University Press, Cambridge.
- Stace, C. (2010). New Flora of the British Isles, 3rd Edition. Cambridge University Press, Cambridge.
- Thomson A. (2004). MATCH version 4 for Windows NT/95/98/2000/XP - A computer programme to aid the assignment of vegetation data to the communities and sub-communities of the National Vegetation Classification. University of Lancaster, Lancaster.



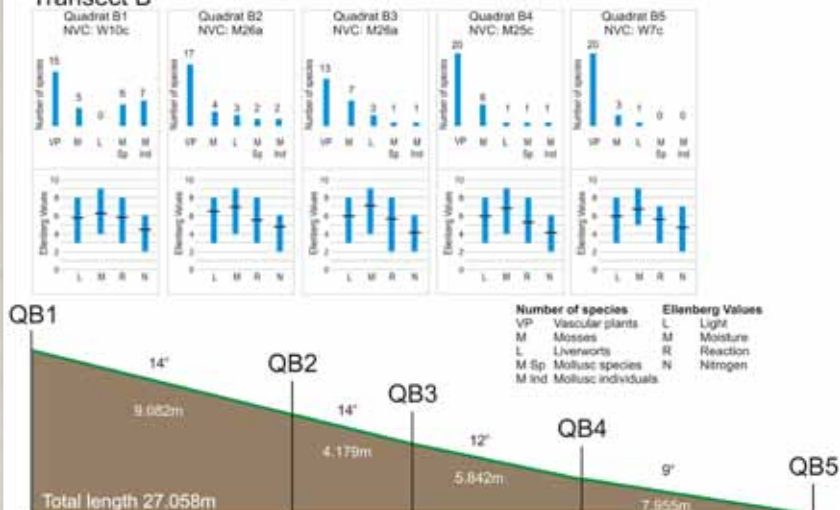
The Site 12 November 2013

Rosemary Winnall

Transect A



Transect B



Transect C

