

A417 Missing Link
TR010056

6.4 Environmental Statement
Appendix 8.24 Assessment of
Tufaceous Vegetation

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Procedure) Regulations 2009

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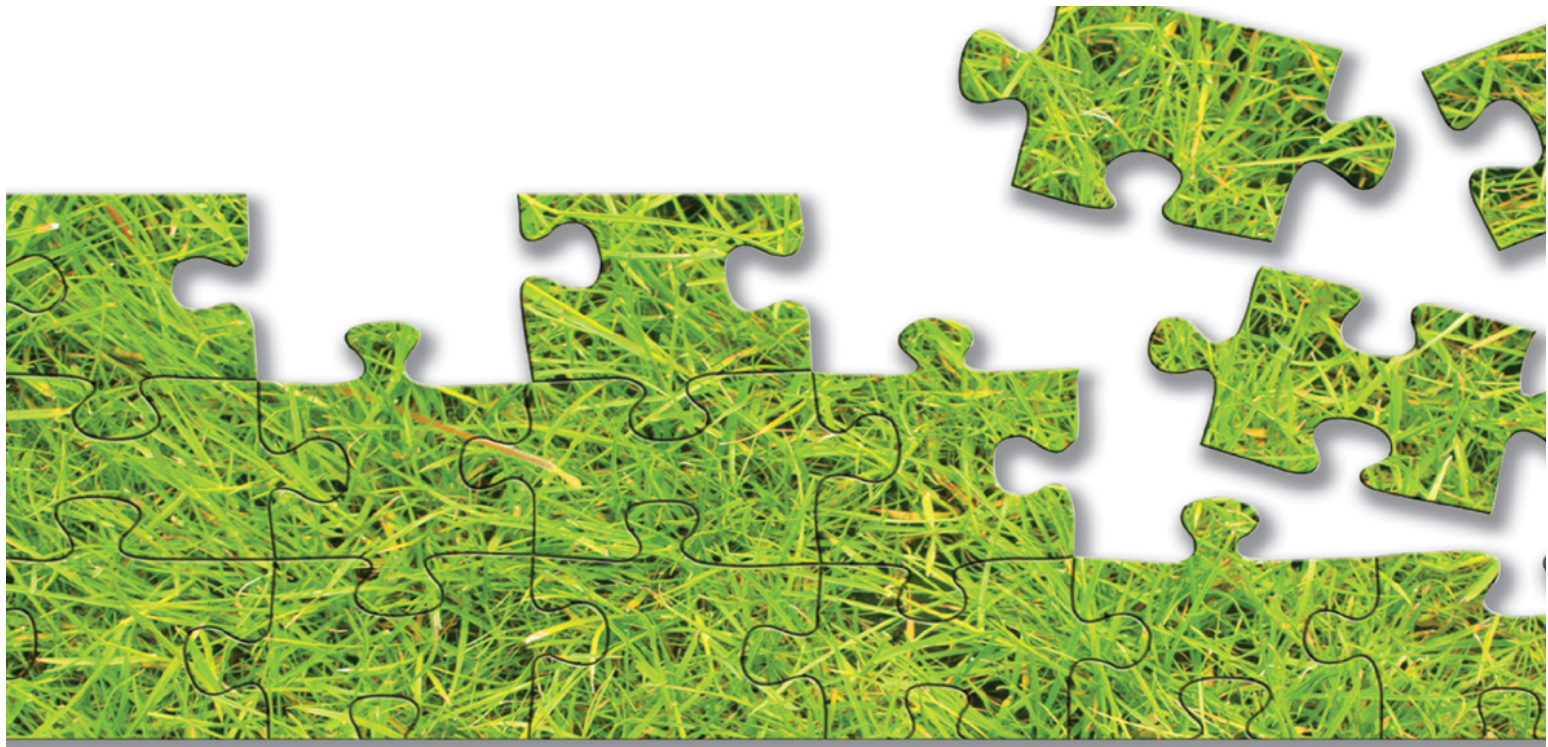
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**6.4 Environmental Statement
Appendix 8.24 Assessment of Tufaceous Vegetation**

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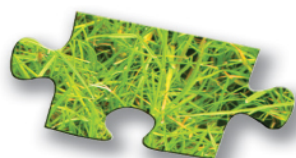


VEGETATION SURVEY & ASSESSMENT

A417 MISSING LINK SCHEME

ASSESSMENT OF TUFACEOUS VEGETATION

Revised July 2020



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Sharon Pilkington BSc (Hons) MSc CEnv MCIEEM
Botanist – Bryologist – Vegetation Ecologist

Vegetation Survey & Assessment Ltd
66 Newtown
Westbury
Wiltshire
BA13 3EF

Tel: 01373 827074

Mob: [REDACTED]

www.vegetationsurvey.co.uk

I. INTRODUCTION

I.1 Scope of Work and Objectives

This report is the product of a contract to botanically assess and characterise a number of hydrological features near Birdlip in Gloucestershire and determine whether they should be regarded as the Annex I habitat H7220 Petrifying springs with tufa formation (Cratoneurion).

The majority of features were identified during previous ecological assessments of land likely to be directly or indirectly affected by construction of the proposed A417 Missing Link Scheme.

I.2 Conservation Context

Under the EC Habitats Directive (92/43/EEC), tufaceous deposits which qualify as the Annex I habitat H7220 Petrifying springs with tufa formation (Cratoneurion) are defined as 'hard water springs with active formation of tufa'. These formations are found in such diverse environments as woodlands or open countryside. They are generally small (point or linear formations) and dominated by the pleurocarpous moss *Palustriella commutata* (referred to hereafter in this report as *Palustriella*).

In the UK, the vegetation of such springs conforms to the National Vegetation Classification (NVC) types M37 *Palustriella commutata* - *Festuca rubra* spring community and M38 *Palustriella commutata* - *Carex nigra* spring community. As the M38 *Palustriella commutata* - *Carex nigra* spring community is confined to the uplands and is characteristic of montane springs in the northern Pennines and the central Scottish Highlands (Rodwell 1991), it is not considered relevant to the current assessment.

The most extensive and/or best developed examples of the M37 *Palustriella commutata* - *Festuca rubra* spring community also tend to be found in upland districts. The majority of sites which have been selected as Special Areas of Conservation because of the presence of the Annex I habitat H7220 Petrifying springs with tufa formation (Cratoneurion) are in upland, lime-rich parts of northern England, Wales and Scotland. Tufaceous springs represented by the M37 *Palustriella commutata* - *Festuca rubra* spring community also occur locally in southern England and other lowland areas, but such examples are poorly represented in the literature and further study is needed to characterise these properly.

In the lowlands, the M37 *Palustriella commutata* - *Festuca rubra* spring community is also usually dominated by *Palustriella*, although locally *Cratoneuron filicinum* may wholly or partially replace it. Other associates vary greatly but often include *Festuca rubra* (Red Fescue), *Agrostis stolonifera* (Creeping Bent) and the bryophytes *Bryum pseudotriquetrum*, *Didymodon tophaceus* and *Pellia endiviifolia*.

Tufa formation is usually, but not exclusively, associated with hard-water springs, where lime-rich groundwater comes to the surface. On contact with the air, carbon dioxide is lost from the water and a hard deposit of calcium carbonate is formed. These conditions occur most often in areas underlain by limestone or other calcareous rocks, and particularly in the uplands of northern England and the Scottish Highlands.

There is no standard classification for the freshwater carbonate deposits known as tufa. Pentecost (1981) describes tufa as a soft, porous, calcareous rock formed in springs, waterfalls and lakes in limestone regions and Pedley (1990) describes it as a highly porous or "spongy" freshwater carbonate rich in microphytic and macrophytic growths, leaves and woody tissue. A number of different kinds of tufa deposit have been described (Table 1). An alternative term, travertine, is generally used to describe older, well lithified and often laminated deposits and is not considered applicable to the features assessed in the current work.

Table 1. Geomorphological classification of tufa formation types (from Lyons and Kelly, 2016)

| <u>Category</u> | <u>Description</u> |
|------------------|---|
| Cascade | Developing on steep slopes at varying distances from the water source; characterised by massive, frequently complex build-ups |
| Dam | Similar to cascades but forming along streams and rivers and causing the impoundment of water behind a tufa crest |
| Stream crust | Sheet-like deposits forming in streams of intermediate to low gradient; these may merge with cascades |
| Paludal | Formed in low gradient mires where tufa accumulates around the bases of plants, often surrounded by carbonate muds |
| Cemented rudites | Gravels etc. cemented by tufa; often found on coasts where spring water seeps onto shingle banks |
| Oncoids/ooids | Unattached, coated grains (<1mm up to 30cm); the cortex may consist of biotic or abiotic particles, such as stones or plant fragments |

As well as being a rare kind of habitat, H7220 Petrifying springs with tufa formation (Cratoneurion) are vulnerable to loss and change because they are:

- often small - many examples are only a few square metres in extent;
- isolated and vulnerable to changes in management;
- sensitive to abstraction or interruption of groundwater – this can cause dewatering and loss of characteristic and rare species;
- low nutrient habitats - nutrient enrichment from surface water, groundwater and/or atmospheric pollution is associated with a decrease in species richness and loss of rare species.

2. METHODOLOGY

Four hydrological features where potential for tufaceous vegetation had been identified following a review of the Water Features Survey (ES Appendix 13.11) were assessed. Two of these were along a tributary of Norman's Brook south of the A417 near Crickley Hill (G231 and 81, at Ordnance Survey National Grid Reference SO 9281 1573 and SO 9240 1570 respectively). The other two were near Watercombe Farm, Brimpsfield (G111 and an un-named spring and rivulet rising nearby in Bushley Muzzard, Brimpsfield Site of Special Scientific Interest at SO 9439 1318 and SO 9434 1342 respectively). The latter site was highlighted in the course of a botanical survey of the SSSI (Pilkington 2019) whereas the other three had been identified in earlier ecological/hydrological surveys associated with the road scheme assessment.

All four sites were surveyed in good weather conditions on 19th March 2020 by Sharon Pilkington, a professional botanist, bryologist and vegetation ecologist with 20 years' experience of botanical assessment. The referencing of the features follows that of the Water Features Survey (ES Appendix 13.11).

There is no standard methodology applicable to ecological assessment of tufaceous vegetation. In 2014, Natural Resources Wales (NRW) let a contract to investigate the hydrology, topography and vegetation of certain Welsh examples of this feature (Farr, Graham and Stratford, 2014). The current methodology is based loosely on the approach taken to the ecological aspects of that work.

A visual assessment of each feature was undertaken to determine the ecological boundary of the tufa formation (where present) and its associated vegetation. This focussed on homogenous vegetation dominated by *Palustriella* and/or *C. filicinum*.

Where tufaceous vegetation was found, a detailed field map was drawn, noting locations of individual spring heads, runnels and tufa and *Palustriella* / *C. filicinum*-dominated vegetation. Photographs were also taken to highlight particular details. Each feature was also sketched to produce an overview map placing it in the context of other physical features nearby.

Within the constraints imposed by the season, a complete list of vascular plants, bryophytes (mosses, liverworts and hornworts) and macroalgae was recorded for each feature with the occurrence of each species recorded using the DAFOR scale¹. Where a feature was in woodland, woody species were noted only where they were rooted within the feature.

Although formal NVC sampling was not undertaken, the species present in each hydrological feature meant that it was mostly straightforward to visually assign vegetation to NVC communities as described by Rodwell (1991). Where the M37 *Palustriella commutata* - *Festuca rubra* spring community was found to be present, a condition assessment was undertaken against attributes and targets indicated by Common Standards Monitoring (CSM) guidance (JNCC 2004).

¹ DAFOR: Dominant, Abundant, Frequent, Occasional, Rare (relative to the survey area)

3. RESULTS

Botanical nomenclature used in this report follows Stace (2019) for vascular plants and Hill *et al* (2008 as amended) for bryophytes. Appendix I shows tabulated data collected from all sites where sampling was undertaken. A record of CSM attributes and targets used for the condition assessment (adapted from JNCC 2004) is provided as Appendix II.

3.1 Feature G23 I

A tufaceous stream crust 1-3 metres wide occupies the channel of a small rivulet entering the Norman's Brook tributary in mature W8 *Fraxinus excelsior* – *Acer campestre* – *Mercurialis perennis* woodland (Figure 1). At the time of survey, it was fed by a single spring rising in pasture, flowing into a grassy runnel and in turn a shallow, silt-bottomed pool used by drinking livestock and heavily poached around its margins. Like the runnel and spring, the pool lacks tufa deposits and is dominated by *Glyceria* (a sweet-grass) and *Juncus inflexus* (Hard Rush).

The stream crust (Figure 2) is intact and undisturbed, extending from the outfall of the pool (where there is a fence) approximately 12 m downhill at an estimated gradient of 20° to the brook, where it ends in a prominent tufaceous step covered in *Palustriella* (Plate 1). Oncoidal/oidal tufa is also present on twigs and stones lying on top of the stream crust.

The stream crust supports sparse bryophyte-dominated vegetation that is consistent with a relatively poorly developed example of the M37 *Palustriella commutata* - *Festuca rubra* spring community. *Palustriella* is frequent but forms less than 5% cover. Also frequent are *C. filicinum*, *Pellia endiviifolia* and *Chrysosplenium oppositifolium* (Opposite-leaved Golden-saxifrage), none of which exceed 2% cover.

Figure 1

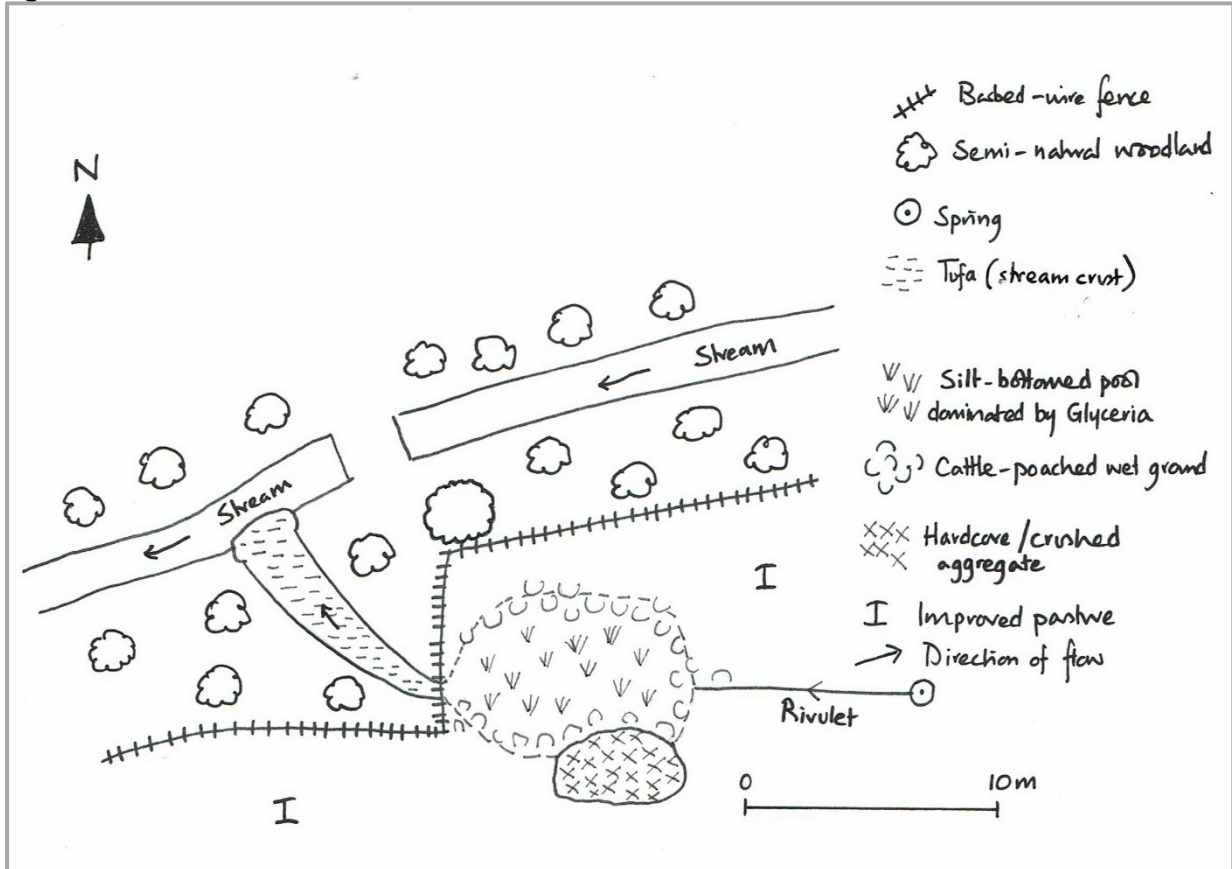
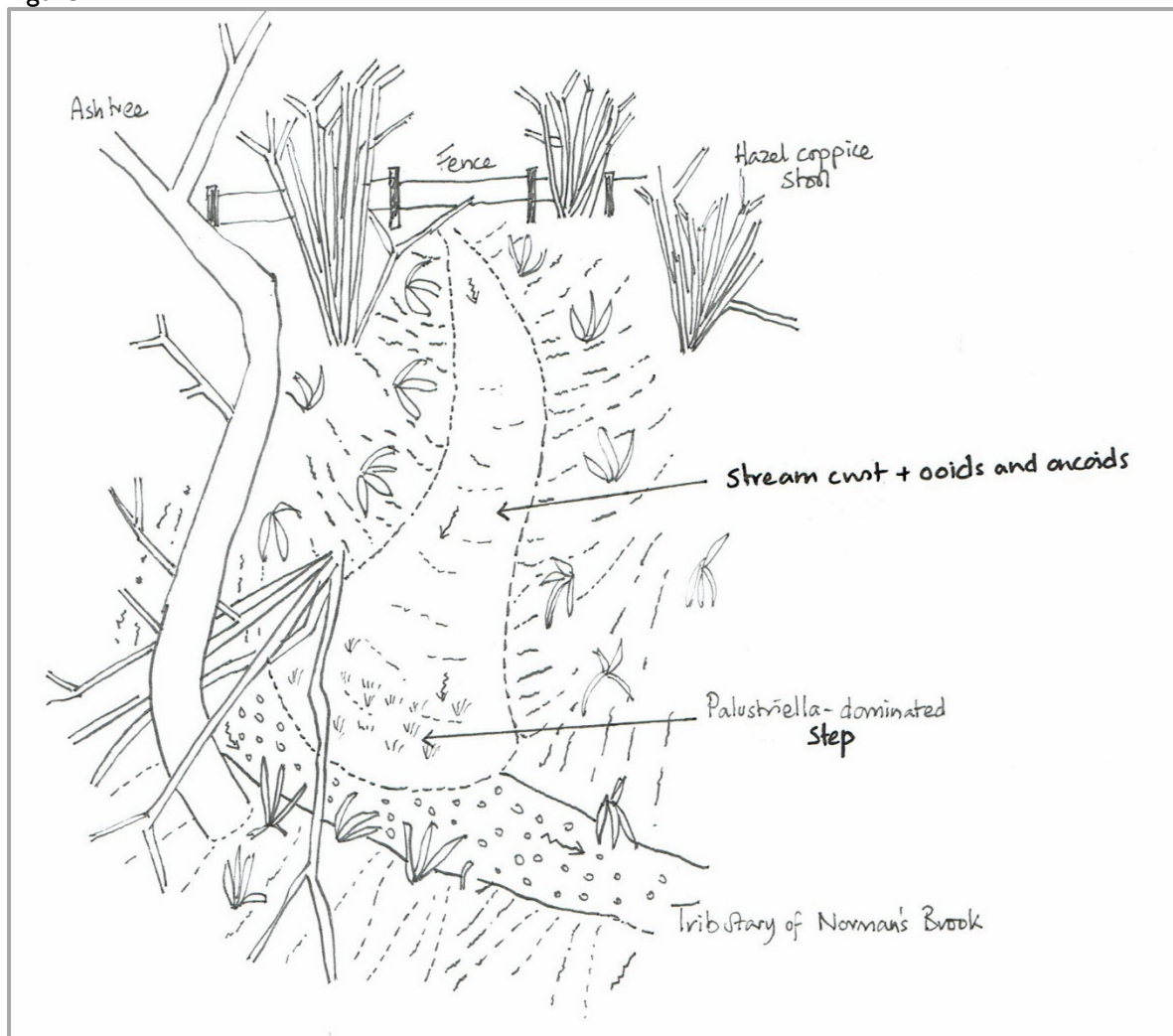


Figure 2



A condition assessment of this feature (Table 2) indicates that it is in Unfavourable Condition, largely because the stream crust is not vegetated sufficiently.

Table 2. Condition Assessment of Feature G231

| Mandatory attribute | Result | Favourable/unfavourable |
|---|---|---|
| Habitat structure: exposed substrate | 80% | Unfavourable (M37) |
| Habitat structure: litter | Negligible | Favourable |
| Vegetation composition: positive indicators | 3 positive indicators present, combined cover of <i>Palustricola</i> and <i>C. filicinum</i> <10% | Favourable - indicates poorly developed M37 |
| Vegetation composition: indicators of negative change – undesirable non-woody species | No invasive non-native species present; <i>Kindbergia praelonga</i> O | Favourable |
| Vegetation composition: indicators of negative change – woody species | None | Favourable |

Plate 1



3.2 Feature 81

Feature 81 lies within the same stream catchment as G231 and is approximately 500 metres from that feature. However, it has quite different physical character and vegetation. It comprises a springline flush in gently dipping wet woodland below the A417. The whole flush is approximately 30 metres wide and extends 20–25 m from the stream to the springs (Figure 3).

Each of the three springs flows into a small silty runnel which meanders southwards through the flush to the brook. There is a very small amount of oncoidal/ooidal tufa on small stones and twigs in two of the runnels (Plate 2) but no other tufa deposits, nor bryophytes characteristic of tufaceous vegetation are present.

Between runnels the flush is characterised by wet silt with high cover of *C. oppositifolium* (Plate 3). Frequent to abundant associates include the moss *Brachythecium rivulare*, *Equisetum telmateia* (Great Horsetail), *Carex pendula* (Pendulous Sedge), *Poa trivialis* (Rough Meadow-grass) and more locally, *Urtica dioica* (Common Nettle). Sprawling mature *Salix cinerea* (Grey Willow) forms a semi-open canopy of sorts and nearby *Alnus glutinosa* (Alder) over *U. dioica* indicates a transition to W6 *Alnus glutinosa* – *Urtica dioica* woodland, a common and widespread form of lowland wet woodland.

In NVC terms, this springline flush can be classified as M36 *Lowland springs and streambanks of shaded situations*, a community of the field and ground layers of various kinds of wet woodland where seepage lines and damp stream banks occur (Rodwell 1991). The prominence of *C. oppositifolium* and several other associates is highly characteristic. M36 *Lowland springs and streambanks of shaded situations* is not associated with tufaceous vegetation and is not regarded as a qualifying NVC community of the Annex I habitat H7220 Petrifying springs with tufa formation (Cratoneurion). No condition assessment of the feature was therefore undertaken.

Figure 3

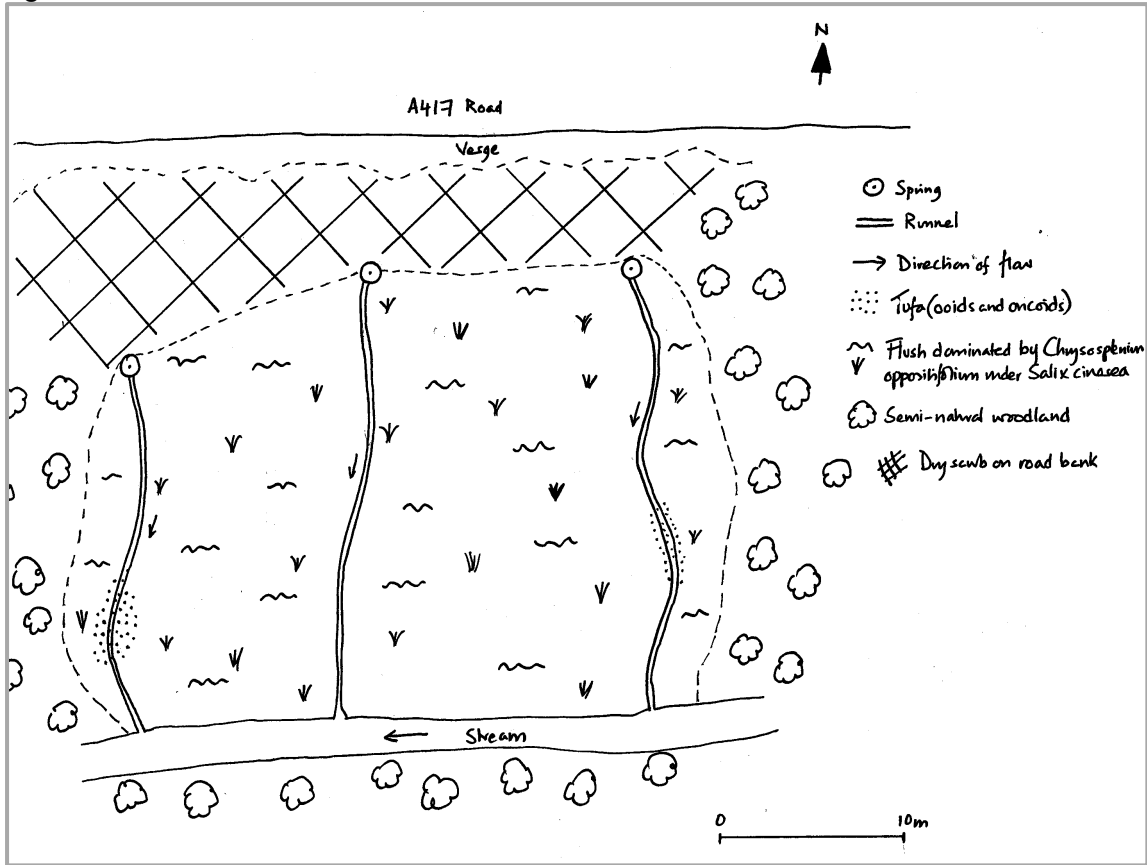


Plate 2



Plate 3



3.3 Feature GIII

A potential tufa-forming deposit was highlighted at the outfall of a pond in open secondary woodland and scrub (Figure 4). Inspection of this feature showed that no tufaceous vegetation is present, although there is some local deposition of hard calcium carbonate crusts on man-made weir structures and on rocks in the stream immediately below the weir.

Vegetation in the stream is dominated by common riparian mosses growing on rocks and concrete and in particular *Platyhypnidium riparioides* and *B. rivulare*. A species of *Vaucheria*, a green pelt-like filamentous alga, is also frequent in the flowing water. A single mound of *Palustriella* is growing on one side of the concrete weir (Plate 4) but this species is absent from the rest of the feature.

Feature GIII's vegetation is not referable to M37 *Palustriella commutata* - *Festuca rubra* spring community and it is not possible to classify it confidently as any other NVC community. No condition assessment was therefore undertaken.

Figure 4

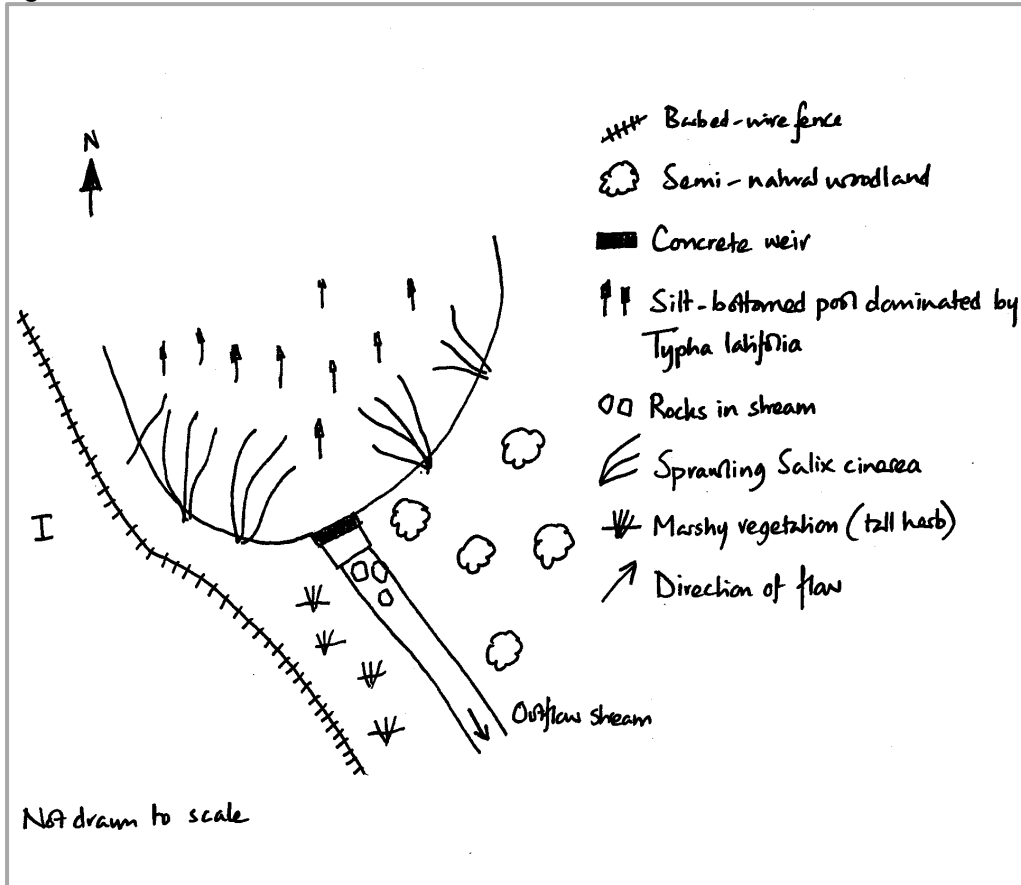


Plate 4. Red arrow shows single mound of *Palustriella*



3.4 Feature in Bushley Muzzard, Brimpsfield SSSI

A single, lime-rich spring rising on an east-facing slope in Bushley Muzzard, Brimpsfield SSSI feeds a small but active rivulet that eventually enters the pond above Feature G I I I. It supports rich vegetation, including many mounds of *Palustriella* and *C. filicinum*. Oncoids and ooids are frequent among silt in the channel but it is difficult to estimate their extent because of heavy poaching of the rivulet by cattle and possibly other livestock (Figure 5, Plate 5).

The hummocks created by the poaching support certain uncommon plants including *Carex lepidocarpa* (Long-stalked Yellow-sedge) and *Valeriana dioica* (Marsh Valerian). Common plants also characteristic of the hummocks include *F. rubra*, *Carex flacca* (Glaucous Sedge) and the pleurocarpous moss *Calliergonella cuspidata*. In the water itself, which has a predominantly silty substrate, *Apium nodiflorum* (Fool's Water-cress), *Nasturtium officinale* agg. (water-cress), *J. inflexus* and a *Glyceria* (sweet-grass) are all common.

A survey of the SSSI's terrestrial vegetation in 2019 indicated that this supports vegetation intermediate between M37 *Palustriella commutata* - *Festuca rubra* spring community and the M22 *Juncus subnodulosus* - *Cirsium palustre* fen-meadow. When undertaking condition assessment, it is important to choose well-defined examples of the vegetation feature being assessed. As the vegetation in the feature appears to be transitional, it was not possible to undertake a condition assessment of it.

Figure 5

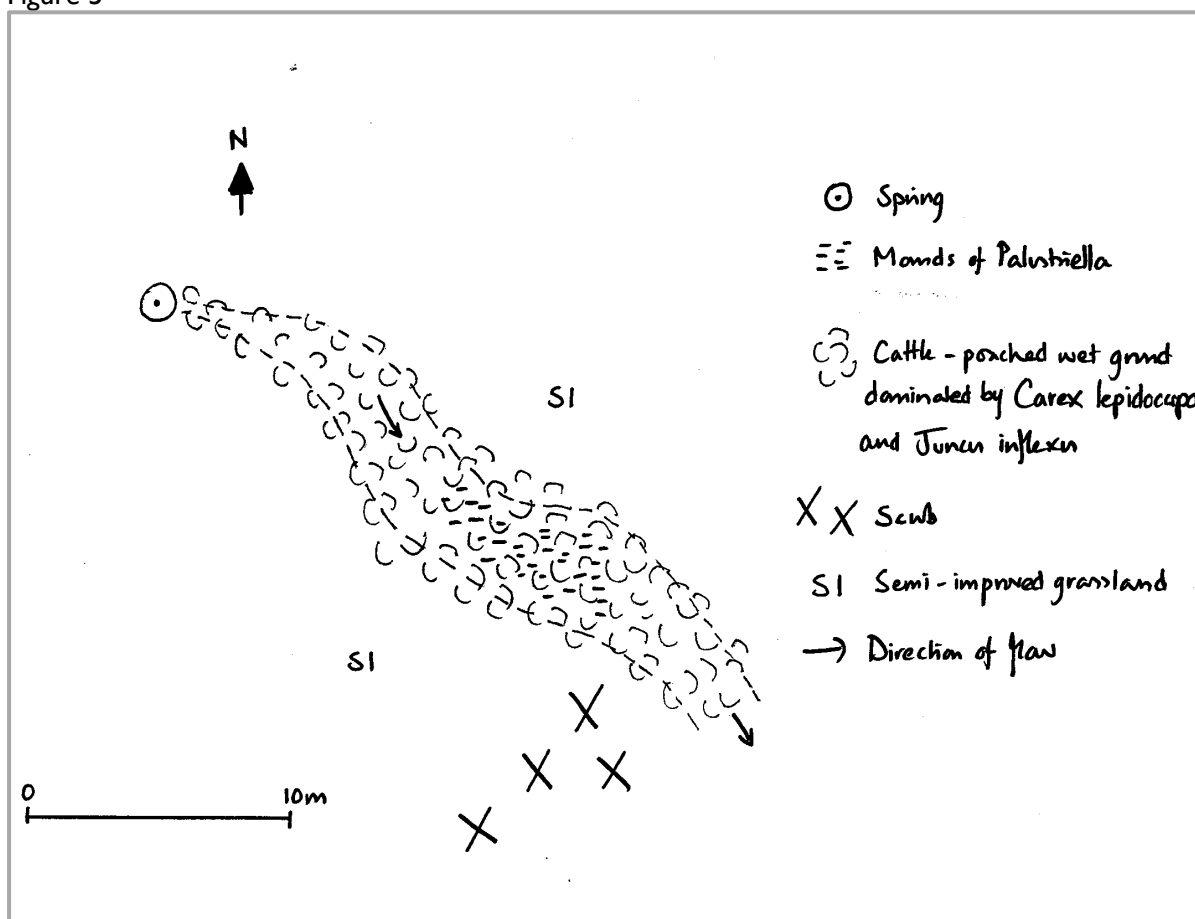


Plate 5



3.5 Other Features

One feature was not previously identified but was noticed during the current assessment. A small tufa-depositing spring rises close to the edge of mature *Fraxinus excelsior* (Ash) woodland (Birtlands Grove) at SO 9425 1339 and appears to also be within the boundary of Bushley Muzzard, Brimpsfield SSSI. The wood is fenced off from the adjacent pasture and no survey was undertaken because of uncertainty over its ownership. Large mounds of *Palustriella* are visible in the trickle of water coming from the spring but without access to the woodland interior no further botanical assessment was made. This feature corresponds to feature G25 in the Water Features Survey (ES Appendix 13.11).

4. CONCLUSIONS

Of the four features that were assessed and characterised, only G23 I would be considered to support qualifying vegetation of the Annex I habitat H7220 Petrifying springs with tufa formation (Cratoneurion). The undisturbed nature of this feature appears to have contributed to the accumulation of a substantial stream crust with loose overlying oncoids and ooids, but its vegetation is quite a poorly developed example of the M37 *Palustriella commutata* - *Festuca rubra* spring community. The reasons for this are unclear but may be linked to the tufaceous deposits being under closed semi-natural woodland canopy and hence heavily shaded, as well as a possibly variable or intermittent flow from the single spring feeding it.

Nearby, 8I represents an interesting springline flush in wet woodland but has very little tufa and its vegetation does not qualify as the Annex I habitat H7220 Petrifying springs with tufa formation (Cratoneurion).

The species-rich streamlet fed by the spring rising in Bushley Muzzard, Brimpsfield SSSI is clearly very lime-rich and it is likely that if it were not so heavily poached, it would have substantial tufaceous deposits. Whilst *Palustriella* is more frequent in this feature than any of the others and its vegetation has some affinities to the M37 *Palustriella commutata* - *Festuca rubra* spring community, it is not a straightforward example and therefore cannot be unequivocally regarded as the Annex I habitat H7220 Petrifying springs with tufa formation (Cratoneurion). Potentially, an intact example of this habitat type lies in woodland elsewhere in the SSSI and it is recommended that an assessment is undertaken to confirm its status.

G11 I, located at a man-made weir controlling the outfall of a pond, does not support tufa-forming vegetation.

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APPENDIX I. FIELD DATA

| Species name | English name | G231 | 81 | G111 | SSSI |
|--|----------------------------------|------|----|------|------|
| <i>Agrostis stolonifera</i> | Creeping Bent | | | | O |
| <i>Ajuga reptans</i> | Bugle | | O | | |
| <i>Allium ursinum</i> | Ramsons | | R | | |
| <i>Alnus glutinosa</i> | Alder | | R | | |
| <i>Amblystegium serpens</i> | Creeping Feather-moss | | R | | |
| <i>Angelica sylvestris</i> | Wild Angelica | | R | R | |
| <i>Anthriscus sylvestris</i> | Cow Parsley | | | R | |
| <i>Apium nodiflorum</i> | Fool's-water-cress | | | | A |
| <i>Arum maculatum</i> | Lords-and-Ladies | | R | | |
| <i>Asplenium scolopendrium</i> | Hart's-tongue | F | R | | |
| <i>Brachypodium pinnatum</i> | Heath False-brome | | | | F |
| <i>Brachythecium rivulare</i> | River Feather-moss | R | F | F | |
| <i>Brachythecium rutabulum</i> | Rough-stalked Feather-moss | | F | | O |
| <i>Calliergonella cuspidata</i> | Pointed Spear-moss | | | | F |
| <i>Cardamine flexuosa</i> | Wavy Bitter-cress | | R | R | |
| <i>Cardamine pratensis</i> | Cuckooflower | | R | R | |
| <i>Carex flacca</i> | Glaucous Sedge | | | | F |
| <i>Carex lepidocarpa</i> | Long-stalked Yellow-sedge | | | | A |
| <i>Carex pendula</i> | Pendulous Sedge | R | A | | |
| <i>Chrysosplenium oppositifolium</i> | Opposite-leaved Golden-saxifrage | F | D | O | |
| <i>Cirsium palustre</i> | Marsh Thistle | | R | | F |
| <i>Conocephalum conicum</i> | Great Scented Liverwort | R | | | |
| <i>Cratoneuron filicinum</i> | Fern-leaved Hook-moss | R | O | F | |
| <i>Didymodon sinuosus</i> | Wavy Beard-moss | | | R | |
| <i>Dryopteris dilatata</i> | Broad Buckler-fern | R | | | |
| <i>Equisetum telmateia</i> | Great Horsetail | | A | | |
| <i>Epilobium</i> sp. | a willowherb | | | | O |
| <i>Festuca rubra</i> | Red Fescue | | | | O |
| <i>Ficaria verna</i> | Lesser Celandine | | R | | O |
| <i>Filipendula ulmaria</i> | Meadowsweet | | | | O |
| <i>Fissidens adianthoides</i> | Maidenhair Pocket-moss | | R | | |
| <i>Fissidens pusillus</i> | Petty Pocket-moss | R | | | |
| <i>Fissidens taxifolius</i> var. <i>taxifolius</i> | Common Pocket-moss | | | R | R |
| <i>Galium aparine</i> | Cleavers | | R | | |
| <i>Geranium robertianum</i> | Herb-Robert | | R | R | |
| <i>Glechoma hederacea</i> | Ground-ivy | | R | | |
| <i>Glyceria</i> sp. | a sweet-grass | | | | F |
| <i>Hedera helix</i> | Common Ivy | R | | R | |
| <i>Holcus lanatus</i> | Yorkshire-fog | | R | | O |
| <i>Juncus acutiflorus/articulatus</i> | Sharp-flowered Rush/Jointed Rush | | | | R |
| <i>Juncus inflexus</i> | Hard Rush | | | | F |

| Species name | English name | G23 I | 8 I | G I I I | SSSI |
|-----------------------------------|--------------------------------|--------------|------------|----------------|-------------|
| <i>Kindbergia praelonga</i> | Common Feather-moss | O | O | | |
| <i>Lunularia cruciata</i> | Crescent-cup Liverwort | | | R | |
| <i>Mentha aquatica</i> | Water Mint | | | | O |
| <i>Mercurialis perennis</i> | Dog's Mercury | | O | | |
| <i>Nasturtium officinale</i> agg. | Water-cress | | | R | F |
| <i>Oxyrrhynchium hians</i> | Swartz's Feather-moss | O | R | | O |
| <i>Palustriella commutata</i> | Curled Hook-moss | F | | R | F |
| <i>Pellia endiviifolia</i> | Endive Pellia | F | R | R | F |
| <i>Plagiomnium undulatum</i> | Hart's-tongue Thyme-moss | | R | O | R |
| <i>Platyhypnidium riparioides</i> | Long-beaked Water Feather-moss | F | O | A | |
| <i>Poa trivialis</i> | Rough Meadow-grass | | A | | |
| <i>Pohlia melanodon</i> | Pink-fruited Thread-moss | | | | O |
| <i>Polystichum setiferum</i> | Soft Shield-fern | R | | | |
| <i>Ranunculus repens</i> | Creeping Buttercup | | R | | O |
| <i>Rhizomnium punctatum</i> | Dotted Thyme-moss | R | O | | |
| <i>Ribes uva-crispa</i> | Gooseberry | O | | | |
| <i>Rubus fruticosus</i> agg. | Bramble | | R | | |
| <i>Rumex sanguineus</i> | Wood Dock | | R | | |
| <i>Salix cinerea</i> | Grey Willow | | F | | |
| <i>Sambucus nigra</i> | Elder | | R | | |
| <i>Schedonorus giganteus</i> | Giant Fescue | | R | | |
| <i>Scrophularia auriculata</i> | Water Figwort | | R | | |
| <i>Thamnobryum alopecurum</i> | Fox-tail Feather-moss | R | | O | |
| <i>Urtica dioica</i> | Common Nettle | | F | | |
| <i>Vaucheria</i> sp. | an alga | | O | F | |
| <i>Valeriana dioica</i> | Marsh Valerian | | | | O |
| <i>Veronica beccabunga</i> | Brooklime | | | | O |

APPENDIX II: COMMON STANDARDS MONITORING GUIDANCE ATTRIBUTES AND TARGETS - M37 PALUSTRIELLA COMMUTATA - FESTUCA RUBRA SPRING COMMUNITY

Modified from standard CSM guidance for monitoring designated sites (JNCC 2004). All attributes are mandatory.

| Attribute | Targets | Method of Assessment | Comments |
|---|---|--|--|
| Habitat structure | <p>The total extent of exposed substrate across the area assessed should be no more than 25%.</p> <p>The total extent of litter cover across the area assessed should be no more than 25%.</p> | Visual estimate of % cover | <p>A high frequency and cover of exposed substrate will usually be undesirable and may indicate, <i>inter alia</i>, over-grazing, and water scour.</p> <p>More than 25% litter cover indicates insufficient removal of biomass by grazing.</p> |
| Vegetation composition: positive indicator species | The frequencies of positive indicators should at the very least confirm the presence of M37. | Visual assessment of frequency and cover | See table below |
| Vegetation composition: indicators of negative change – undesirable non-woody species | <p>Invasive non-native species should be absent, or no more than rare if present</p> <p>No more than 2 other undesirable species to be more than frequent with combined cover of all such species no more than 15%.</p> | Visual assessment of frequency and cover | See table below |
| Vegetation composition: indicators of negative change – undesirable woody species | No woody species (including <i>Betula</i> , <i>Salix</i> , <i>Rhododendron</i> , <i>Pinus</i> , other gymnosperms) species should be present on flushes & springs, although <i>Salix</i> is acceptable at least 5m from petrifying springs. | Visual assessment of the whole feature | |

Positive Indicator species

| NVC type | Relevant wetland type | Positive indicators (major, desirable and associated vascular plants and bryophytes) |
|----------|---|---|
| M37 | Petrifying springs with tufa formation (Cratoneurion) | <i>Festuca rubra</i> , <i>Carex nigra</i> , <i>C. panicea</i> , <i>Cardamine pratensis</i> , <i>Scorzoneroides autumnalis</i> , <i>Carex viridula</i> , <i>C. dioica</i> , <i>Agrostis stolonifera</i> , <i>A. canina</i> , <i>Deschampsia cespitosa</i> , <i>Equisetum palustre</i> , <i>Chrysosplenium oppositifolium</i> , <i>Poa trivialis</i> , <i>Trifolium repens</i> , <i>Bryum pseudotriquetrum</i> , <i>Palustriella commutata</i> , <i>Cratoneuron filicinum</i> , <i>Philonotis fontana</i> |

Negative indicator species

| Type | Negative indicators |
|-------------------------------|--|
| Invasive non-natives | <i>Crassula helmsii</i> , <i>Acorus calamus</i> , <i>Mimulus</i> spp., <i>Impatiens glandulifera</i> , <i>Fallopia japonica</i> , <i>Heracleum mantegazzianum</i> |
| Undesirable non-woody species | Graminoids: <i>Phragmites australis</i> , <i>Phalaris arundinacea</i> , <i>Glyceria maxima</i> , <i>Typha latifolia</i> , <i>Juncus</i> spp., <i>Molinia caerulea</i> , <i>Holcus lanatus</i> Tall herbs: <i>Epilobium hirsutum</i> , <i>Urtica dioica</i> , <i>Pteridium aquilinum</i> . <i>Rubus fruticosus</i> agg. Bryophytes: <i>Brachythecium rutabulum</i> , <i>Kindbergia praelonga</i> and <i>Sphagnum fallax</i> . |