



Survey of Harford Spring Mire, Harford Moor 2021



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1 Introduction

1.1 Background

This survey was commissioned by the Foundation for Common Land as part of their project **“Our Common Cause” – Our Upland Commons** – a project that aims to conserve and enhance the heritage of Commons and Commoning in Dartmoor, Yorkshire Dales, Shropshire Hill and the Lake District.

The aim of the survey was to provide a baseline assessment of the vegetation communities present and a habitat condition of Harford Spring Mire prior to interventions to restore the mire. It was requested that the survey would specifically:

- Align to JNCC common standards methodology appropriate for the habitat
- Assign to NVC community with maps and species list
- Collect information (albeit at less detail) about the type and condition of the surrounding habitat transitional to the mire communities.

1.2 Site details

Site Name:	Harford Spring Mire
Site Location	Harford Moor
Statutory Designation	Dartmoor National Park
Parishes	Harford
District	South Hams
County	Devon
Central Grid Reference	SX 6535 5925
Area	1.36 ha
Elevation	325–340 m AOD

The small mire is situated on Harford Moor, lying between Weatherdon Hill and Hangershell Rock at 325–340m, above the Moorland Line (England), and within registered common land and the unenclosed open moorland of Dartmoor National Park. The whole site lies over Granite (British Geological Survey 1984), which is overlain by the Laployd soil series, which are generally wet, acid soils with a wet, peaty surface horizon (Soil Survey of England and Wales 1983; Cranfield University, 2019). The mire occupies moderately steep north-west facing slopes where springs issue and drain down the site. The mire is grazed by cattle, sheep and horses as part of a larger grazing unit or lea of Harford Moor.

The site has public access with the ‘Two Moors Way’ long-distance public footpath running through the lower part of the site along the route of the disused railway. The site is included in the Access Land of the CRoW Act 2000. The site is in private ownership and was surveyed with the kind permission of the land owners.

2 Methods

The survey took place on 5th and 8th October 2021 after a period of heavy rain.

NVC survey

The vegetation survey followed standard techniques, with all vegetation stand types within the mire mapped to National Vegetation Classification (NVC) sub-community (Rodwell, 1991, 1992).

Due to limited size of the site and the complexity of the vegetation all stands were mapped to 1:1000 scale in the field to try to capture the vegetation at a fine grain. Vegetation communities of at least 10 sq m in area were mapped; those of less than 10 sq m were target-noted). Current habitat boundaries were mapped onto base maps using habitat features and National Grid co-ordinates taken in the field using hand-held GPS receivers. Practice has shown these to be accurate in most cases to at least 5m, although in small sites visual clues and surface features were also used by the surveyor to increase accuracy of mapping.

Five quadrats (one in very small areas of habitat) were recorded from each sub-community. Quadrat information included the abundance of all species of ¹vascular plant, terricolous bryophytes and lichens on the DOMIN scale, from which a ‘constancy’ score was calculated: quadrats measured 2m × 2m. All quadrat points were located to 10-figure grid references using the GPS. Quadrat data was analysed using the MATCH 2.16 software, which provides a measure of ‘fit’ (% match) to the data for each vegetation community in the published tables in the NVC guides (Rodwell, 1991a,b).

Domin scale

Domin score	% cover
10	91–100%
9	76–90%
8	51–75%
7	24–50%
6	26–33%
5	11–25%
4	4–10%
3	Many individuals, < 4%
2	Several individuals, < 4%
1	Few individuals, < 4%

Constancy scale

Constancy score	Frequency in samples	% frequency in samples
V	5 samples in 5	81–100%
IV	4 samples in 5	61–80%
III	3 samples in 5	41–60%
II	2 samples in 5	21–40%
I	1 sample in 5	1–20%

¹ Nomenclature for higher plants follows that of Stace (2019) and for bryophytes follows Atherton *et al.* (2010).

A 'whole site' species list was compiled and a measure of frequency on the DAFOR scale was recorded.

DAFOR ratings:

D = dominant A = Abundant F = Frequent O = Occasional R = Rare

L = Locally (frequent, abundant, dominant)

+ = Present

Target notes were taken in the field to describe features of interest and were mapped and some digital images were recorded to help demonstrate characters of the vegetation referred to in the results.

Condition assessment and monitoring

A condition assessment based on the guidelines for Common Standards Monitoring produced by JNCC for upland habitats (JNCC, 2009) was used. The condition assessment consisted of a 10–20-stop structured walk through each of the mire vegetation communities recording variables relating to the composition and structure of the vegetation at each stop including 'positive indicator' species and negative attributes. From the presence/absence data a measure of frequency for positive and negative indicator species could be determined for the stand as a whole.

GIS

The survey map from the field survey was digitised using QGIS 3.10 to produce Esri compatible shapefiles (.shp) and an image file (.jpg) created to provide a map for the subsequent report.

3 Results

Overview walk-over

Harford Spring mire is composed of a complex mosaic of vegetation communities relating to the hydrology of the site (see map in Appendix 1; Plate 1, Appendix 2). There are several rills that on the day of survey had running water: these had a liquid mineral soil and sparse aquatic flora (Plate 2, . Associated with the rills were soakways; narrow bands of vegetation occupying highly waterlogged shallow peats (10–40cm depth) on the periphery of the rills and also in other areas where the water levels fluctuate (Plate 3, Appendix 2). Between the soakways and rills was a mire community that supported poor fen vegetation, with drier areas supporting wet heath vegetation (Plate 4, Appendix 2). It was impossible to map these separately as the surface patterning was complex and at a fine grain. The mire and wet heath community occupied the deepest peat; up to 95cm was recorded.

A herd of Belted Galloway cows with calves were grazing the short acid grassland at the foot of the mire on the second day of survey. A small number of sheep were also grazing in the dry

heath above the site. Grazing pressure was of medium intensity and there was evidence of stock movement across (down) the site and associated poaching, particularly down the soakway that runs down the site along the southern boundary. Whilst poaching was light in the mire community away from the soakways, it was heavy in the southern soakway (Plates 5 and 6, Appendix 2). The heavier level of poaching in this area could be attributed to: (1) the greater vulnerability of more waterlogged soils to the effects of stock movement; (2) the likelihood that stock routinely follow a route through (up/down) this part of the mire to travel from one grazing area to another, and (3) the possibility that stock selectively visit this spring mire to drink as the rills and associated pools are a source of water.

With the exception of grazing, no recent management (such as drainage or cutting) was evident but the mire has been affected by historical activity: it is intersected at its lowest extent by a (now disused) railway line that is now a trackway and public right of way. The former railway cut into the natural slope of the mire and is likely to be the initial reason for the erosion noted at the lowest extent of the mire. Here there were peat hags (Plate 7, Appendix 2) which may have initially resulted from the peat being exposed for the shallow railway cutting, but exacerbated by the movement of water downhill. The deepest peat hagg was nearly a metre. Stock movement may also be contributing to the enlargement of the peat hags as water collects and pools at the foot of the peat hags.

Habitats

These vegetation communities present are described below in relation to the National Vegetation Classification (NVC) communities within which they have been mapped (Rodwell 1992a,b).

M35 *Ranunculus omiophyllus*–*Montia fontana* rill community

The open water of the springs (rills) as they run down the slope and pool just above the disused railway track support a sparse to moderate cover of floating vegetation including round-leaved water-crowfoot *Ranunculus omiophyllus*, water starwort *Callitriche* sp., cow's-horn bog-moss *Sphagnum denticulatum* (syn. *S. auriculatum*) and lesser spearwort *Ranunculus flammula*, with bog pondweed *Potamogeton polygonifolius*, bulbous rush *Juncus bulbosus* and occasional marsh pennywort *Hydrocotyle vulgaris*. This community overlies loose mineral soil with gravel rather than peat and is best described in NVC term as M35 *Ranunculus omiophyllus*–*Montia fontana* rill community (Plate 8, Appendix 2). A single quadrat was recorded in this community (Appendix 3).

M29 *Hypericum elodes*–*Potamogeton polygonifolius* soakway community

To either side of the rills, where there is strong surface seepage and groundwater movement a soakway community has developed with some peat accumulation (typically 20–60cm). Cow's-horn bog-moss is constant in this community at cover values from 10% to >90% but

typically at 25–75%. Other bryophytes were scarce in this community and largely confined to occasional small patches of other *Sphagnum* species such as flat-topped bog-moss *Sphagnum fallax* (syn. *S. recurvum*), papillose bog-moss *Sphagnum papillosum* and feathery bog-moss *Sphagnum cuspidatum*. Bog pondweed was constant in these soakways, often at high cover (typically 10–30%); also constant was purple moor-grass *Molinia caerulea*, bulbous rush *Juncus bulbosus* and lesser spearwort but all other associates were occasional to frequent, such as velvet bent *Agrostis canina*, common cottongrass *Eriophorum angustifolium*, bog asphodel *Narthecium ossifragum*, star sedge *Carex echinata*, yellow sedge *Carex viridula* spp. *oedocarpa* and carnation sedge *Carex panicea*. Marsh St John's-wort *Hypericum elodes* was locally frequent only but could attain 20% cover where it did occur. Taller rushes – sharp-flowered rush *Juncus acutiflorus* and soft rush *Juncus effusus* were present but mostly sparse in the soakways (although see M6c below). This soakway community is a good fit for M29 *Hypericum elodes*–*Potamogeton polygonifolius* soakway community (68.9% 'fit' to the published tables using MATCH 2.14 software), although is patchy and often transitional to short-sedge acidic fen (or poor-fen) as described below. In practice it was often difficult to separate the two where communities co-existed in micro-habitats. Five quadrats were recorded in this community; the results are shown in Appendix 3. See Plate 9, Appendix 2; and Appendix 3, quadrats 1–5.

M6 *Carex echinata*–*Sphagnum recurvum/auriculatum* mire

M6a *Carex echinata* sub-community

Between soakways a waterlogged short sedge acidic fen has developed, with drier areas having affinities with wet heath. Small-leaved sedges dominate this community with star sedge, carnation sedge and common cottongrass dominating the open, low-growing vegetation although common sedge *Carex nigra* and yellow sedge also featured at lower frequency and cover. Also locally abundant was many-stalked spike-rush *Eleocharis multicaulis*, which spread into the shallower soakways. Heath rush *Juncus squarrosus* was frequent but sparse. Purple moor-grass was constant and could attain quite high cover (10–30%) but was mostly short and recently grazed – tussocks were rare. Other grasses included frequent velvet bent, locally frequent mat-grass *Nardus stricta* and rare sheep's fescue *Festuca ovina*. Bryophytes were more diverse in this poor fen (poor meaning base-poor in this context) with constant cow's-horn bog-moss (typically 10–30% cover), frequent lustrous bog-moss *Sphagnum subnitens* and locally frequent papillose bog-moss, feathery bog-moss and the occasional occurrence of blunt-leaved bog-moss *Sphagnum palustre* and *Sphagnum inundatum* (syn. *S. auriculatum* var. *inundatum*). Other bryophytes included occasional heath plait-moss *Hypnum jutlandicum*, woolly fringe-moss *Racomitrium lanuginosum* and springy turf-moss *Rhytidiadelphus squarrosus*. Devil's-bit scabious *Succisa pratensis* was frequent in the forb component with more open stands also supporting quite abundant (relatively speaking as these species are very small rosette-forming plants) round-leaved sundew *Drosera rotundifolia* and pale butterwort *Pinguicula lusitanica*. These two diminutive carnivorous plants colonise areas of bare peat. Bog asphodel *Narthecium ossifragum* was frequent to

locally abundant – up to 20% cover but usually at 5–10%. Tormentil *Potentilla erecta* was frequent at low cover and there were occasional plants of heath milkwort *Polygala serpyllifolia* and scattered marsh violet *Viola palustris*. Lousewort *Pedicularis sylvatica* was recorded rarely. Cross-leaved heath *Erica tetralix* was more frequent within the quadrats sampled for this fen community than would be expected and demonstrates the fine grain of this mire habitat, where drier raised areas what is essentially wet heath fall within the same 2m quadrat as poor fen or even soakway habitat. The fen community has closest affinities with M6 *Carex echinata*–*Sphagnum recurvum/auriculatum* mire, with the five quadrats showing a good fit variously to either M6a *Carex echinata* sub-community . To the northern end of the mire the wet heath element is far more marked and a transition to M15a *Scirpus cespitosus*–*Erica tetralix* wet heath, *Carex panicea* sub-community can be seen, although largely lacking *Trichophorum germanicum* (syn. *Scirpus cespitosus*). See Plate 10, Appendix 2; and Appendix 3, quadrats 6–10.

M6c *Juncus effusus* sub-community

Although larger rush species are rare across most of the mire and occur as scattered plants there are discrete areas where soft rush *Juncus effusus* dominates: this occurs at spring heads and where water movement and/or accumulation is greater prohibiting peat accumulation. These areas support dominant soft rush with abundant common haircap *Polytrichum commune* in a carpet of moss below. Other typical species include velvet bent, lesser skullcap, marsh pennywort, a little common cottongrass and some purple moor-grass. Sphagnum mosses are at lower cover and here flat-topped bog-moss outcompetes cow's-horn bog-moss for cover and frequency. This community is M6c *Carex echinata*–*Sphagnum recurvum/auriculatum* mire, *Juncus effusus* sub-community. See Plate 11, Appendix 2; and Appendix 3, quadrat 11.

M15a *Scirpus cespitosus*–*Erica tetralix* wet heath, *Carex panicea* sub-community

Wet heath occurs in a complex mosaic with the M6a poor fen community, occupying slightly raised areas of drier peat, and a transition to this community is seen at the northern end of the site. Supporting many of the same species as the M6a community, ericoids (namely cross-leaved heath and heather) are more frequent but always at low cover and stature. Lichens such as *Cladonia portentosa* are more frequent and Devil's-bit scabious of greater frequency with much bog asphodel and common cottongrass. The usual associate deer-grass *Trichophorum germanicum* is rare in the stand though. See Plate 12, Appendix 2. Quadrats were not recorded within this community as it was poorly defined and in mosaic with M6a. The M6a quadrats (Appendix 3) capture both communities in mosaic.

Species

A total of 50 native plant species were recorded from the survey area during the field survey (Appendix 4) – this list is not exhaustive as a greater number of hours in the field would not doubt yield more, especially bryophyte species (mosses and liverworts). No non-native vascular plant was recorded. These species were generally typical of these habitats; some are included in the English Red Data List (Stroh *et al* 2014), such as devil’s-bit scabious (Near Threatened - NT), heather (NT), cross-leaved heath (NT), round-leaved sundew (NT), common cottongrass (Vulnerable – VU), lousewort (NT) and tormentil (NT) .

Species typical of exposed peat and vulnerable to habitat loss through poor management were present: round-leaved sundew and pale butterwort – both diminutive rosette forming species.

Bryophytes were abundant, particularly *Sphagnum* moss – the bog-moss or peat-moss: an estimate for the site would be a mean of 40% cover, although it could be 30% or up to 80%.. Cow’s-horn bog-moss *S. denticulatum* was the most abundant but *Sphagnum* diversity was good with at least seven species present. Common haircap *Polytrichum commune* was locally abundant in soft-rush dominated areas. Other mosses were common species typical of upland mires such as springy turf-moss *Rhytidiadelphus squarrosus*, heath plait-moss *Hypnum jutlandicum* and bog-bead moss *Aulacomnium palustre*.

4 Condition Assessment

M29 *Hypericum elodes*–*Potamogeton polygonifolius* soakway community

The M29 soakway community present on this site is priority BAP habitat of Upland Fen, Flush and Swamp (<https://jncc.gov.uk/our-work/uk-bap/>). Due to the limited extent of this community on site only 10 stops were recorded, five in each of two separate soakways. The first was the more poached soakway to the south of the site, and the second was a more intact soakway towards the centre of the site.

Overall the soakways failed the common standards monitoring condition assessment. From the whole stand assessment the M29 on site is fails the following mandatory attributes:

Variable	Measure	Target	Summary	Pass/Fail
Extent of feature	Yes/No	No reduction in loss of feature	?%	Fail
Presence of drainage	Yes/No	Less than 10% of total feature should show signs of drainage, resulting from ditches or heavy trampling or tracking	20%	Fail
Cover of bare ground	% cover	Disturbed bare ground should cover less than 25% of each soakway	29%	Fail
Cover of graminoids	% cover	Less than 10% of vegetation cover should be made up of other graminoids. Include <i>Juncus acutiflorus</i> and <i>Juncus effusus</i> , but exclude <i>Molinia</i> and sedges.	14%	Fail
Cover of positive indicator species	% cover	At least 65% of vegetation cover should be made up of indicator species: <i>Carex</i> spp., <i>Hypericum elodes</i> , <i>Potamogeton polygonifolius</i> & <i>Sphagnum</i> spp.	63%	Fail

The 'loss of extent of feature' is hard to quantify but the presence of areas of almost 100% poached mud, albeit limited in extent, and erosion at the foot of the rills and soakways above the disused railway, demonstrates past and present loss of the soakway feature. This loss is likely to continue to increase with further erosion from water movement compounded by stock movement.

The soakways passes the following attributes:

Variable	Measure	Target	Summary	Pass/Fail
Cover of non-native vegetation	% cover	Less than 1% of vegetation cover should be made up of non-native species.	0%	Pass
Cover of trees and scrub (all)	% cover	Less than 5% of vegetation cover should be made up of trees and shrubs.	0%	Pass
Presence of vascular plants	Yes/No	Either <i>Hypericum elodes</i> or <i>Potamogeton polygonifolius</i> should be present in the vegetation cover	Y	Pass
Cover of purple moor-grass	% cover	Less than 20% of vegetation cover should be made up of <i>Molinia caerulea</i> .	2%	Pass

Of the positive indicator species, *Carex* spp. (small to medium sized sedges) were present in 9 of 10 stops; Marsh St John's-wort *Hypericum elodes* was present in 4 stops; bog pondweed *Potamogeton polygonifolius* was present in 7 stops and bog-mosses *Sphagnum* spp. were present in 8 stops with an overall cover of c. 35%.

If analysed separately, the southernmost soakway would have performed worse than the central soakway – most of the heavier poaching damage was recorded here.

M6 *Carex echinata*–*Sphagnum recurvum/auriculatum* mire

The M6 poor fen or short sedge acid mire community on this site is priority BAP habitat of Upland Fen, Flush and Swamp. A 15-stop condition assessment was carried out for the stand of M6a including the M6a/M15a wet heath mosaic at the northern extent. The fine grain of this mosaic prevented assessing them separately.

Fifteen of the stops were in the largest single expanse of the M6a habitat in the central area and a further five were in the fen/wet heath transition to the north.

When considered as a whole stand the M6 in site 75 fails the condition assessment on the following mandatory attributes:

Variable	Measure	Target	Summary	Pass/Fail
Extent of feature	Yes/No	No reduction in loss of feature	?%	Fail

Cover of purple moor-grass	% cover	Less than 20% of vegetation cover should be made up of <i>Molinia caerulea</i> .	24%	Fail
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The 'loss of extent of feature' is hard to quantify but the presence of peat hags and erosion at the foot of the mire, above the disused railway, demonstrates past loss of the mire feature. This loss is likely to continue to increase with further erosion from water movement compounded by stock movement.

The fen passes the following attributes:

Variable	Measure	Target	Summary	Pass/Fail
Indicators of grazing	% cover	At least 50% of live leaves and flowering shoots of vascular species should be more than 15cm above ground surface	c. 50%	Pass
Cover of trees and scrub (all)	% cover	Less than 10% of vegetation cover should be made up of scattered native trees and shrubs.	0%	Pass
Presence of drainage	Yes/No	Less than 10% of total feature should show signs of drainage, resulting from ditches or heavy trampling or tracking	Range = 3 –7 Mean = 4.67	Pass
Cover of bare ground	% cover	Less than 10% of the ground cover should be disturbed bare ground	5%	Pass
Frequency of indicator species	Yes/No	There should be at least 2 indicator species present in the vegetation	Range = 3 –7 Mean = 4.67	Pass
Cover of positive indicator species	% cover	At least 50% of vegetation cover should be made up of indicator species (25% from each of groups 1 and 2)	50%	Pass
Cover of negative species	% cover	Less than 1% of vegetation cover should be made up of , collectively <i>Anthoxanthum odoratum</i> , <i>Epilobium hirsutum</i> , <i>Holcus lanatus</i> , <i>Phragmites australis</i> , <i>Ranunculus repens</i>	0%	Pass

5 Conclusions and recommendations

The small mire complex at Harford Spring Mire is relatively botanically rich with at least 50 species of vascular plant and lower plant within a small area (c. 1.36 ha). The soakway and short sedge acid fen (poor fen) communities that make up the bulk of the mire are part of the Upland Fen, Flush and Swamp priority habitat of the UK BAP² and Section 41 of the NERC Act³. and of conservation value at a local and national scale. The fen habitat is in mosaic and transitional to a wet heath community that would be described under the UK BAP habitat as Upland Heath. Peat depth within the mire is up to 90cm. Peatlands are important locally, nationally and internationally and provide long-term carbon stores. Peatlands are a

² (<https://data.jncc.gov.uk/data/6fe22f18-fff7-4974-b333-03b0ad819b88/UKBAP-BAPHabitats-59-UplandFlushesFensSwamps.pdf>)

³ <https://www.legislation.gov.uk/ukpga/2006/16/section/41>

diminishing resource and are highly vulnerable to degradation through changes in hydrology and management.

The site has been assessed for its condition according to common standards monitoring guidelines and has failed on several variables. The soakway community (M29 *Hypericum elodes*–*Potamogeton polygonifolius*) fails on loss of extent of the feature, cover of bare ground, heavy trampling & tracking, cover of graminoid species, and on cover of positive indicators of this habitat. There appears to be an issue with the use of this mire by grazing stock, which are tracking through this site to access grazing and possibly also to access water for drinking. This is creating undue poaching pressure and the loss of indicator species such as *Sphagnum* moss, bog pondweed and marsh St John's-wort.

The fen community is far less poached, and is in better condition, failing only on loss of extent of feature and on cover of purple moor-grass, which is slightly high. The feature loss is due to the existence of peat hags and erosion at the foot of the mire above the track. This undoubtedly started with the creation of the disused railway, which is an historic event, but is probably being compounded by the movement of water which has speeded up as a consequence of this erosion and by the movement of stock. Stock tend to gather in peat hags for protection from the elements and will access pooled water below peat hags for drinking.

Stock access is desirable for the management of mire vegetation communities as, in the absence of stock and grazing, more aggressive species such as purple moor-grass, soft rush and western gorse will grow unchecked and will outcompete lower-growing species. Ungrazed mires become tussocky, scrubby and species poor. The aim should be to get the balance right with grazing pressure and to reduce poaching and further erosion.

The following measures could be considered to conserve and enhance the mire:

- Determine movement of stock through the site.
- Create an alternative nearby drinking source for the stock nearby to encourage them away from the soakways within the mire.
- *Reducing stock numbers / grazing duration
- Slow the flow of the water through the mire with timber dams or woody dams in the rills and soakways.
- Re-profile larger peat hags to prevent further erosion from water and wind.

*This may not be feasible and there is a danger of subsequently undergrazing the rest of the mire, which currently does not appear over-grazed.

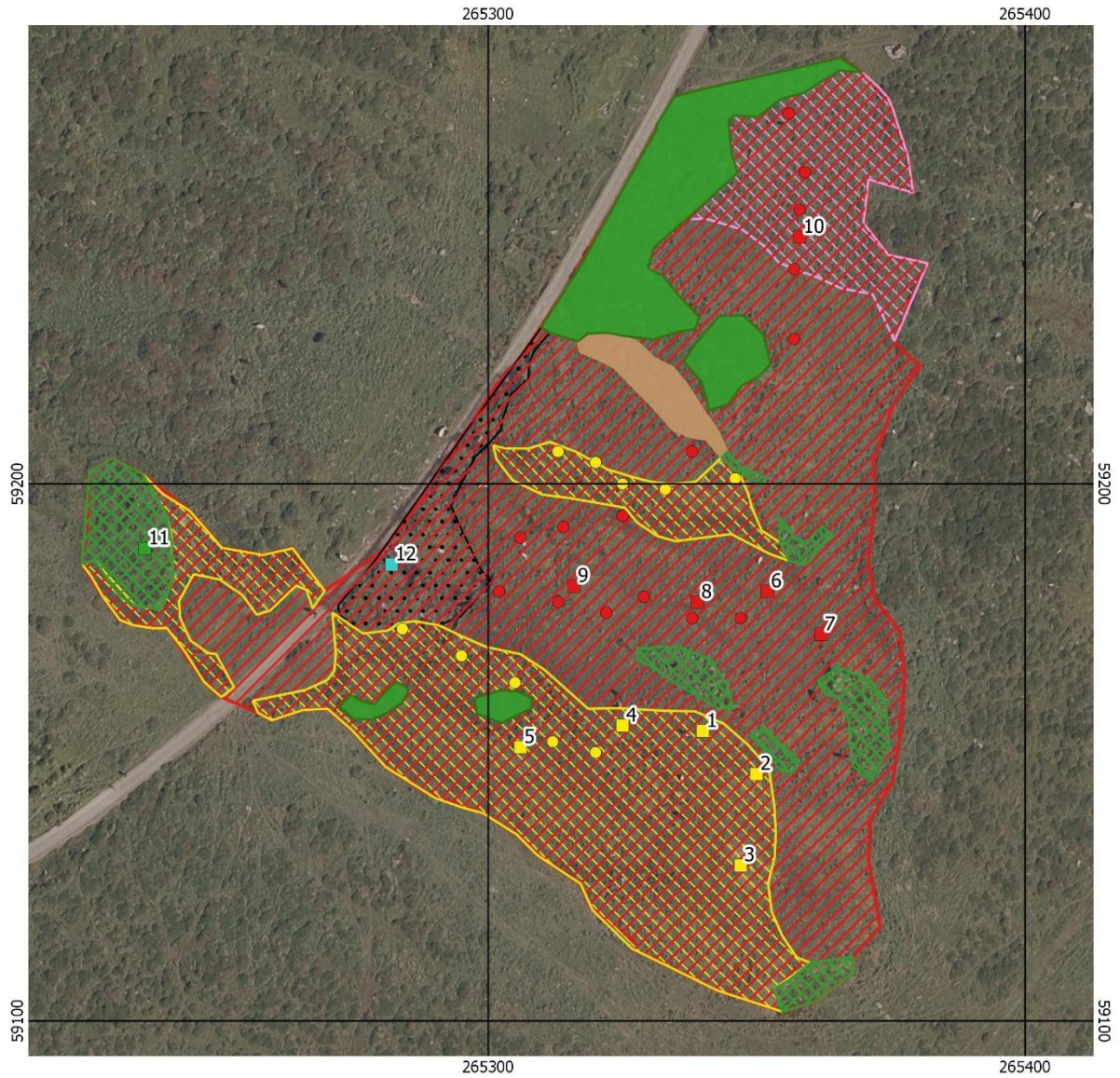
Whilst fencing the mire is not recommended as the exclusion of stock altogether could have a greater negative outcome than the current poaching damage. (Fenced enclosures within the unenclosed moorland are also intrinsically unappealing.) Some consideration has been given in preparing this report to how to discourage the stock from the more vulnerable, more waterlogged area of the mire (the soakways). A short section of non-enclosing, unobtrusive

post and rail wooden fence at the top of the southern-most soakway, or a few carefully placed boulders, may encourage the stock to follow a different route down the mire if they are indeed looking for water and there is another source available. However, there is a danger of just moving the stock further into the mire and essentially 'moving the problem'. The surrounding habitat to the south of the mire is drier acid grassland and then heathland: this habitat would be far less vulnerable to poaching but getting the cattle to go this way may not be easy.

6 References

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Appendix 1: NVC map of Harford Spring Mire



Key:

Condition stops

- M29
- M6a

Quadrats

- M29
- M6a
- M6c
- M35

NVC community

- Western gorse and heathers on raised boulder zones - H8
- Short dry to damp acid grassland
- Transition from M6 fen to M15 wet heath
- Soft rush dominated M6c fen
- Upland fen with sedge-dominated M6a
- Molinia-dominated tussocky M25a
- Soakways with M6/M29 mosaic
- Erosion gullies with mosaics of open water, fen and dry communities

Appendix 2: Digital images



Plate 1 Harford Spring mire looking N from southern-most soakway.



Plate 2 Rill flowing through the southern part of the site forming the southern site boundary.



Plate 3 More impermanent watertracks with soakway community.



Plate 4 Poor fen and wet heath mosaic



Plate 5 Heavy poaching through the southern soakway and rill.



Plate 6 Localised very heavy poaching



Plate 7 Peat hagg with c. 1m exposed peat just above disused railway line



Plate 8 M35 rill community supporting bog pondweed, water crow-foot and water starwort



Plate 9 Cow's-horn bog-moss, marsh St John's-wort and bog pondweed in sparse M29 soakway community



Plate 10 M6a Short sedge acid fen or poor fen community on deeper peat



Plate 11 M6c Soft rush dominated discrete stands within the mire complex



Plate 12 Devil's-bit scabious, Cross-leaved heath and bog asphodel in areas transitional to M15a wet heath

Appendix 3: NVC Quadrat Data

Key:

Domin scale

Domin score	% cover
10	91–100%
9	76–90%
8	51–75%
7	24–50%
6	26–33%
5	11–25%
4	4–10%
3	Many individuals, < 4%
2	Several individuals, < 4%
1	Few individuals, < 4%

Constancy scale

Constancy score	Frequency in samples	% frequency in samples
V	5 samples in 5	81–100%
IV	4 samples in 5	61–80%
III	3 samples in 5	41–60%
II	2 samples in 5	21–40%
I	1 sample in 5	1–20%

M35 *Ranunculus omiophyllus*-*Montia fontana* rill

Quadrat code	12					
Surveyor	BRW					
Date	05/10/2021					
Grid Ref (GPS)	SX65282 59185					
Quadrat size (m × m)	2 × 2					
Slope	Moderate					
Aspect	NW					
Photo number						
Peat depth	25					
Description	M35					
	1					
<i>Potamogeton polygonifolius</i>	7					
<i>Juncus bulbosus</i>	6					
<i>Sphagnum denticulatum</i>	6					
<i>Ranunculus omiophyllus</i>	6					
<i>Agrostis canina</i>	4					
<i>Molinia caerulea</i>	4					
<i>Callitriche</i> sp.	4					
<i>Eriophorum angustifolium</i>	3					
<i>Juncus effusus</i>	2					
<i>Ranunculus flammula</i>	1					
Open water	5					
Bare soil	5					

M29 *Hypericum elodes*-*Potamogeton polygonifolius* soakway

Quadrat code	1	2	3	4	5	
Surveyor	BRW	BRW	BRW	BRW	BRW	
Date	05/10/2021	05/10/2021	05/10/2021	05/10/2021	08/10/2021	
Grid Ref (GPS)	SX65340 59154	SX65350 59146	SX65347 59129	SX65325 59155	SX65306 59151	
Quadrat size (m × m)	2 × 2	2 × 2	2 × 2	2 × 2	2 × 2	
Slope	Moderate					
Aspect	NW					
Photo number						
Peat depth	60cm	62cm	80cm	30cm	25cm	
Description	M29	M29	M29	M29	M29	
	1	2	3	4	5	Constancy
<i>Eriophorum angustifolium</i>	3	5	4	5	3	V
<i>Juncus bulbosus</i>	3	4	5	5	5	V
<i>Molinia caerulea</i>	5	4	4	5	4	V
<i>Potamogeton polygonifolius</i>	3	5	5	5	3	V
<i>Ranunculus flammula</i>	1	2	2	2	2	V
<i>Sphagnum denticulatum</i>	5	8	4	8	4	V
<i>Agrostis canina</i>		2	3	2	3	IV
<i>Carex echinata</i>	3	4	2	3		IV
<i>Carex viridula</i>	2	2	2	2	3	IV
<i>Narthecium ossifragum</i>	3	1	2	3		IV
<i>Anagallis tenella</i>	2		3		2	III
<i>Eleocharis multicaulis</i>	4	2			3	III
<i>Hydrocotyle vulgaris</i>		1	1		1	III
<i>Juncus acutiflorus</i>	1		1		1	III
<i>Carex panicea</i>	4				1	II
<i>Hypericum elodes</i>	5				4	II
<i>Viola palustris</i>		1	1			II
<i>Drosera rotundifolia</i>	2					I
<i>Erica tetralix</i>	2					I
<i>Juncus effusus</i>					1	I
<i>Sphagnum papillosum</i>				1		I
<i>Sphagnum fallax</i>					1	I
<i>Succisa pratensis</i>				1		I

M6a *Carex echinata*-*Sphagnum recurvum/auriculatum* mire; *Carex echinata* sub-community

Quadrat code	6	7	8	9	10	
Surveyor	BRW	BRW	BRW	BRW	BRW	
Date	05/10/21	08/10/21	08/10/21	08/10/21	08/10/21	
Grid Ref (GPS)	SX65352 59180	SX65362 59172	SX65339 59178	SX65316 59181	SX65358 59246	
Quadrat size (m × m)	2 × 2	2 × 2	2 × 2	2 × 2	2 × 2	
Slope	Moderate	Moderate	Moderate	Moderate	Moderate	
Aspect	NW	NW	NW	NW	NW	
Photo number						
Peat depth	72cm	88cm	94cm	85cm	95cm	
Description	M6a	M6a	M6a	M6a	M6a/M15a	
	1	2	3	4	5	Constancy
<i>Carex echinata</i>	4	4	4	4	1	V
<i>Carex panicea</i>	2	2	5	4	5	V
<i>Eriophorum angustifolium</i>	4	4	5	5	7	V
<i>Sphagnum denticulatum</i>	4	4	5	3	6	V
<i>Agrostis canina</i>	2		4	4	3	IV
<i>Eleocharis multicaulis</i>	5	6	2	4		IV
<i>Erica tetralix</i>	4	4	3		4	IV
<i>Molinia caerulea</i>	6	5	6	5	5	IV
<i>Narthecium ossifragum</i>	4	3		5	5	IV
<i>Potentilla erecta</i>	2	1	3		2	IV
<i>Anagallis tenella</i>	3	2	1			III
<i>Drosera rotundifolia</i>	2		1	1		III
<i>Carex viridula</i>		1		3	2	III
<i>Carex nigra</i>	1	2	1			III
<i>Juncus bulbosus</i>	2	2			3	III
<i>Juncus squarrosus</i>	1	2		2		III
<i>Polygala serpyllifolia</i>	2	1	2			III
<i>Sphagnum subnitens</i>	5		7	4		III
<i>Pinguicula lusitanica</i>		1		2		II
<i>Nardus stricta</i>	2				3	II
<i>Sphagnum papillosum</i>	4			5		II
<i>Succisa pratensis</i>	3			4		II
<i>Viola palustris</i>	1		1		1	II
<i>Aulacomnium palustre</i>	2		2			II
<i>Calluna vulgaris</i>				1		I
<i>Festuca ovina</i>		1				I
<i>Hydrocotyle vulgaris</i>			1			I
<i>Juncus acutiflorus</i>					1	I
<i>Potamogeton polygonifolius</i>		1				I
<i>Sphagnum cuspidatum</i>	2					I
<i>Racomitrium lanuginosum</i>				2		I

M6c *Carex echinata*-*Sphagnum recurvum/auriculatum* mire; *Juncus effusus* sub-community

Quadrat code	11					
Surveyor	BRW					
Date	05/10/21					
Grid Ref (GPS)	SX65236 59188					
Quadrat size (m × m)	2 × 2					
Slope	Gentle					
Aspect	NW					
Photo number						
Peat depth	35cm					
Description	M6c					
	1					Constancy
<i>Juncus effusus</i>	8					
<i>Agrostis canina</i>	7					
<i>Molinia caerulea</i>	5					
<i>Sphagnum recurvum</i>	4					
<i>Carex echinata</i>	3					
<i>Eriophorum angustifolium</i>	3					
<i>Hydrocotyle vulgaris</i>	3					
<i>Scutellaria minor</i>	2					
<i>Lotus pedunculatus</i>	1					
<i>Sphagnum denticulatum</i>	1					

Appendix 4: Species Lists

Nomenclature follows Hill *et al* (2008) and Stace (2019).

DAFOR ratings:

D = dominant A = Abundant F = Frequent O = Occasional

R = Rare

L = Locally (frequent, abundant, dominant)

+ = Present

Table 2 Species list whole mire site

Scientific name	Common name	Frequency
<i>Agrostis canina</i>	Velvet Bent	F
<i>Anagallis tenella</i>	Bog Pimpernel	LF
<i>Aulacomnium palustre</i>	Bog Bead-moss	O
<i>Blechnum spicant</i>	Hard Fern	R
<i>Callitriche sp.</i>	Water-starwort	O
<i>Calluna vulgaris</i>	Heather (Ling)	R
<i>Campylopus atrovirens</i>	Bristly Swan-neck Moss	R
<i>Carex binervis</i>	Green-ribbed Sedge	R
<i>Carex echinata</i>	Star Sedge	A
<i>Carex nigra</i>	Common Sedge	O
<i>Carex panicea</i>	Carnation Sedge	A
<i>Carex pilulifera</i>	Pill Sedge	R
<i>Carex viridula</i>	Yellow Sedge	F
<i>Cladonia impexa</i>	lichen	R
<i>Drosera rotundifolia</i>	Round-leaved Sundew	LF
<i>Eleocharis multicaulis</i>	Many-stalked Spike-rush	LA
<i>Erica tetralix</i>	Cross-leaved Heath	F
<i>Eriophorum angustifolium</i>	Common Cottongrass	A
<i>Festuca ovina</i>	Sheep's Fescue	R
<i>Hydrocotyle vulgaris</i>	Marsh Pennywort	O
<i>Hypericum elodes</i>	Marsh St John's-wort	LF
<i>Hypnum jutlandicum</i>	Heath Plait-moss	O
<i>Juncus acutiflorus</i>	Sharp-flowered Rush	O
<i>Juncus bulbosus</i>	Bulbous Rush	F
<i>Juncus effusus</i>	Soft Rush	LA
<i>Juncus squarrosus</i>	Heath Rush	F
<i>Lotus pedunculatus</i>	Greater Bird's-foot-trefoil	R
<i>Molinia caerulea</i>	Purple Moor-grass	A
<i>Nardus stricta</i>	Mat-grass	F
<i>Narthecium ossifragum</i>	Bog Asphodel	A
<i>Pedicularis sylvatica</i>	Lousewort	O
<i>Pinguicula lusitanica</i>	Pale Butterwort	LF
<i>Polygala serpyllifolia</i>	Heath Milkwort	LF
<i>Polytrichum commune</i>	Common Haircap	LA
<i>Potamogeton polygonifolius</i>	Bog Pondweed	LA
<i>Potentilla erecta</i>	Tormentil	F
<i>Racomitrium lanuginosum</i>	Woolly Fringe-moss	R
<i>Ranunculus omiophyllus</i>	Round-leaved Water-crowfoot	LF

Scientific name	Common name	Frequency
<i>Rhytidiadelphus loreus</i>	Little Shaggy-moss	R
<i>Rhytidiadelphus squarrosus</i>	Springy Turf-moss	R
<i>Sphagnum cuspidatum</i>	Feathery Bog-moss	O
<i>Sphagnum denticulatum</i>	Cow-horn Bog-moss	A
<i>Sphagnum fallax</i>	Flat-topped Bog-moss	LA
<i>Sphagnum inundatum</i>	Lesser Cow-horn Bog-moss	O
<i>Sphagnum palustre</i>	Blunt-leaved Bog-moss	R
<i>Sphagnum papillosum</i>	Papillose Bog-moss	F
<i>Sphagnum subnitens</i>	Lustrous Bog-moss	F
<i>Succisa pratensis</i>	Devil's-bit Scabious	F
<i>Ulex gallii</i>	Western Gorse	LF
<i>Viola palustris</i>	Marsh Violet	F

Appendix 5: Condition Assessment Tables

Frequencies: totals out of 10 stops. 1–2 = rare (R), 3–4 = occasional (O), ≥ 5 = frequent

Soakway and sump interest feature: M29 *Molinia caerulea*–*Potentilla erecta* mire; *Angelica sylvestris* sub-community

Date: 08/10/2021	Site: Harford Common	Assessed by BRW & TT													
Soakway and sump: M29															
Variable	Measure	Target	Whole feature estimate										Summary / Freq.	Pass/Fail	
Extent of feature	Yes/No	No reduction in loss of feature												?	?
Cover of non-native vegetation	% cover	Less than 1% of vegetation cover should be made up of non-native species.												0%	Pass
Cover of trees and scrub (all)	% cover	Less than 5% of vegetation cover should be made up of trees and shrubs.												0%	Pass
Presence of drainage	Yes/No	Less than 10% of total feature should show signs of drainage, resulting from ditches or heavy trampling or tracking	L	M	M	H	H	L	M	M	M	M	20%	Fail	
		Stops	1	2	3	4	5	6	7	8	9	10	Summary / Freq.	Pass/Fail	
		Grid reference (10 figure)	265284,59173		265305,59163	265312,59132	265320,59150	265313,59206	265320,59204	265325,59200	265333,59199	265346,59201			
Cover of bare ground	% cover	Disturbed bare ground should cover less than 25% of each soakway	2	10	5	50	75	10	25	50	30	30	29%	Fail	
Presence of vascular plants	Yes/No	Either <i>Hypericum elodes</i> or <i>Potamogeton polygonifolius</i> should be present in the vegetation cover	y	y	y	y	y	y	y	y	y	y	Y	Pass	
Cover of graminoids	% cover	Less than 10% of vegetation cover should be made up of other graminoids. Include <i>Juncus acutiflorus</i> and <i>Juncus effusus</i> , but exclude <i>Molinia</i> and sedges.	20	7	12	15	15	20	10	15	10	10	14%	Fail	
Cover of <i>Sphagnum</i> spp.			5	10	5	3	5	40	60	55	80	80	35%		
Cover of positive indicator species	% cover	At least 75% of vegetation cover should be made up of indicator species: <i>Carex</i> spp., <i>Hypericum elodes</i> , <i>Potamogeton polygonifolius</i> & <i>Sphagnum</i> spp.	70	65	25	50	10	70	80	80	85	90	63%	Fail	
Cover of purple moor-grass	% cover	Less than 20% of vegetation cover should be made up of <i>Molinia caerulea</i> .	5	1	6	0	1	1	2	1	1	0	2%	Pass	
Positive indicator species - key species															
Carex spp. (small to medium)			1	1	1	1		1	1	1	1	1	9		
<i>Carex echinata</i>				1	1							1			
<i>Carex viridula</i>			1	1	1	1		1	1	1	1				
<i>Hypericum elodes</i>								1	1	1	1		4		
<i>Potamogeton polygonifolius</i>			1	1	1	1	1	1				1	7		
<i>Sphagnum</i> spp.			1	1	1			1	1	1	1	1	8		
<i>Sphagnum denticulatum</i>			1	1	1			1	1	1	1	1			
		Stops	1	2	3	4	5	6	7	8	9	10			

Short Sedge Acid Fen M4–M6

Date: 08/10/2021	Site:	Harford Common	Assessed by		BRW & TT														
Short Sedge Acidic Fen																			
Variable	Measure	Target	Whole feature estimate														Summary / Freq.	Pass/ Fail	
Extent of feature	Yes/No	No reduction in loss of feature																?	?
Indicators of grazing	% cover	At least 50% of live leaves and flowering shoots of vascular species should be more than 15cm above ground surface																Yes	Pass
Cover of trees and scrub (all)	% cover	Less than 10% of vegetation cover should be made up of scattered native trees and shrubs.																0%	Pass
Presence of drainage	Yes/No	Less than 10% of total feature should show signs of drainage, resulting from ditches or heavy trampling or tracking																5-10%	Pass
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Summary / Freq.	Pass/ Fail
		Grid reference (10 figure)	265356,59269	265359,59258	265358,59251	265357,59240	265357,59227	265342,59206	265325,59194	265314,59192	265306,59190	265302,59180	265313,59178	265322,59176	265329,59179	265338,59175	265347,59175		
Cover of bare ground	% cover	Less than 10% of the ground cover should be disturbed bare ground	15	10	5	0	3	10	2	5	0	8	10	5	0	1	1	5%	Pass
Frequency of indicator species	Yes/No	There should be at least 2 indicator species present in the vegetation	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	Y	Pass
Cover of positive indicator species	% cover	At least 50% of vegetation cover should be made up of indicator species (25% from each of groups 1 and 2)	60	60	60	65	40	65	60	50	35	65	45	55	40	30	20	50%	Pass
Cover of negative species	% cover	Less than 1% of vegetation cover should be made up of , collectively <i>Anthoxanthum odoratum</i> , <i>Epilobium hirsutum</i> , <i>Holcus lanatus</i> , <i>Phragmites australis</i> , <i>Ranunculus repens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	Pass
Cover of purple moor-grass	% cover	Less than 20% of vegetation cover should be made up of <i>Molinia caerulea</i> .	10	25	30	30	15	2	25	20	30	7	10	5	50	65	30	24%	Fail

Continued.

Positive indicator species - key species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
(1) <i>Hydrocotyle vulgaris</i>														1			1	
(1) <i>Carex</i> (small to medium)	1	1	1	1	1	1	1	1	1	1	1	1	1	1			14	
<i>Carex echinata</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		15	
<i>Carex nigra</i>												1					1	
<i>Carex panicea</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		15	
<i>Carex viridula</i>	1		1		1				1	1	1		1	1	1		9	
(1) <i>Sphagnum</i> spp.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		15	
<i>Sphagnum capillifolium</i>					1												1	
<i>Sphagnum cuspidatum</i>	1				1	1	1				1				1		6	
<i>Sphagnum denticulatum</i>	1	1	1	1			1	1	1	1	1	1	1	1	1		13	
<i>Sphagnum fallax</i>						1			1								2	
<i>Sphagnum palustre</i>															1		1	
<i>Sphagnum subnitens</i>												1	1		1		3	
<i>Sphagnum papillosum</i>	1			1	1	1	1	1									6	
(1) <i>Potentilla palustris</i>																	0	
(2) <i>Epilobium palustre</i>																	0	
(2) <i>Eriophorum angustifolium</i>	1	1	1	1	1	1	1	1	1	1	1			1	1		13	
(2) <i>Juncus acutiflorus</i>			1	1	1	1	1										5	
(2) <i>Menyanthes trifoliata</i>																	0	
(2) <i>Potentilla erecta</i>			1	1	1	1	1	1		1	1		1	1	1		11	
(2) <i>Ranunculus flammula</i>																	0	
(2) <i>Succisa pratensis</i>							1	1			1	1			1		5	
(2) <i>Viola palustris</i>	1		1		1		1		1				1				6	
<i>Total indicator species per stop</i>	4	3	6	5	6	5	7	5	4	4	5	3	4	5	4		4.67	<i>Total</i>
Other positive indicator species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
<i>Anagallis tenella</i>										1	1			1			3	
<i>Calluna vulgaris</i>		1					1	1	1								4	
<i>Drosera</i> spp.	1						1	1	1	1	1	1		1	1		9	
<i>Erica tetralix</i>		1	1	1	1					1	1	1	1				8	
<i>Narthecium ossifragum</i>	1	1	1	1	1	1	1	1	1	1	1	1	1		1		14	
<i>Pedicularis sylvatica</i>											1						1	
<i>Pinguicula lusitanica</i>										1	1	1	1				4	
<i>Potamogeton polygonifolius</i>									1								1	
<i>Polygala serpyllifolia</i>							1		1			1					3	
<i>Scutellaria minor</i>							1										1	

