Scottish Natural Heritage
Commissioned Report No. 949

Aith Meadows and Burn of Aith Site of Special Scientific Interest: NVC/EUNIS survey and management advice

Scottish Natural Heritage
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COMMISSIONED REPORT

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Aith Meadows and Burn of Aith Site of Special Scientific Interest:

NVC/EUNIS survey and management advice

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COMMISSIONED REPORT

Summary

Aith Meadows and Burn of Aith Site of Special Scientific Interest: NVC/EUNIS survey and management advice

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Keywords

Aith Meadows; SSSI; NVC; EUNIS; lowland neutral grassland; fen meadow.

Background

Aith Meadows and Burn of Aith SSSI is situated in Cunningsburgh, Shetland. It contains extensive wet meadows, traditionally managed for hay. The notified biological features are lowland neutral grassland and fen meadow. These are classified as in 'favourable' but 'declining' condition. The declining condition of the meadows is largely attributed to a decrease in active management.

This research was commissioned by Scottish Natural Heritage primarily to review where the two biological features of the site currently occur. For this purpose, NVC, Annex 1 Habitat and EUNIS survey are required. Advice and recommendations are also required, on transitional communities, their ecological interest and potential as additional site features; and on site management.

Main findings

- The presence of the lowland neutral grassland SSSI feature is confirmed, by the presence of the component communities MG5 *Cynosurus cristatus-Centaurea nigra* grassland and MG8 *Cynosurus cristatus-Caltha palustris* grassland, albeit in unusual, sedge-rich forms.
- The presence of the fen meadow SSSI feature is confirmed; however the component M25 Molinia *caerulea-Potentilla erecta* mire community is scarce and it is recommended that the feature be defined mainly by a non-NVC *Carex nigra* grassland/fen community.
- The identification of NVC communities at this site, including those representing the interest features, proved challenging, because of pronounced local particularities in species composition and frequency, and often fine distinctions between vegetation types on a generally level site.
- Altogether 17 NVC communities and sub-communities and a further four potential new units and variants were identified and mapped. All have been related to corresponding EUNIS habitats and one to a European Habitats Directive Annex 1 habitat.
- It is recommended that valley mire become a new SSSI interest feature.

- Ecological change and transitional communities are discussed and some comparisons made with a previous NVC survey; a mire-heath transition is of particular interest in this context.
- Recommendations for site management are made, regarding drainage and measures to facilitate traditional management, prioritise areas for management and develop grazing plans.

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Thank you also to Ian Strachan, who subsequently gave advice on some unusual and difficult-to-diagnose NVC communities at Aith Meadows and their correspondence to EUNIS, though the author only is responsible for the contents of this report.

Finally, thank you Paul Harvey for hospitality during the survey and enthusiastic interest in Aith Meadows.

1. INTRODUCTION

1.1 Site description

Aith Meadows and Burn of Aith SSSI (henceforth referred to as 'Aith Meadows' or simply as 'Aith') lies at the head of Aith Voe, Cunningsburgh, Shetland. It has an area of 25.17 hectares. The low lying, almost level ground supports extensive wet meadows, traditionally managed for hay. The notified biological features are lowland neutral grassland and fen meadow. The site is also notified for geological and geomorphological features: the sediments and deep peat provide a record of climate and vegetation since the last Ice Age.

Vegetation monitoring has shown a general decrease in the quantity of the key plant species, so that the condition of both the lowland neutral grassland and fen meadow features is now classified as in 'favourable' but 'declining' condition. There is also a serious accumulation of plant litter. The declining condition of the meadows is largely attributed to a decrease in active management (mowing and grazing). Frequent flooding around the main drainage ditch in recent years, with resultant increased water-logging, has been reported and is likely to be a constraint on management.

1.2 SSSI biological interest features

The interest features fen meadow and lowland neutral grassland occupied about 38% and 15% respectively of the total area of the SSSI in 1998, according to the NVC survey then carried out (Hutcheon,1998). The identified NVC community component of fen meadow at the site was M25 *Molinia caerulea-Potentilla erecta* mire. Those of lowland neutral grassland were MG5 *Cynosurus cristatus-Centaurea nigra* grassland and MG8 *Cynosurus cristatus-Caltha palustris* grassland.

1.3 Topography and soils

The site consists of a valley drained by the Burn of Aith in its northern half and a shallow basin to the south. A subterranean ridge of rock lies between the valley and the basin, breaking the surface by the old hall at the head of Aith Voe. The valley is bordered on its northern, western and eastern sides by low hills; here the transition from peat-filled valley to hill pasture and improved grassland is abrupt. The basin has a more gradual transition to low-lying, improved and semi-improved grassland around its western and southern sides; the sea inlet of Aith Voe forms its eastern boundary. The geology of the surrounding hills is of complex metamorphic types. It appears that there is some soligenous influence around the edges of the site, particularly the northeast side. There are houses and crofts scattered around the perimeter of the site and some indications of eutrophication in ditches.

Peat depth is greatest at the north end of the site and part of the south. According to the National Soil Map of Scotland (Scottish Government *et al.*, 2016) most of the site is underlain by peat, bordered by peaty gley on the west side, south of the hamlet of Gord, and by mineral gley to the east and northeast. However, the soil profile can be seen in roadside ditches and there appears to be a surface layer of peat-like material in all parts of the site.

1.4 History of management

The history of the site was not researched in any depth; instead, local knowledge and some photographic evidence were relied upon.

The harvesting of hay from the meadows has been carried on for at least a hundred years and probably much longer. A famous photograph from the 1930s shows the entire site shorn of vegetation and dotted with coles of hay. It is said that all parts of the site were managed in this way until the 1960s. Mowing was traditionally carried out no earlier than August. Not only was the main drain through the northern part of the site, the Burn of Aith, kept clear of vegetation, as it is more or less today, but also the very many secondary ditches radiating from it, which are not. All the land is now apportioned to individual crofts but historically it was held in common. Formerly the common land was grazed by sheep brought down from the hill in winter.

1.5 Current management

Approximately half of the area is still actively managed, most of it by hay cutting, some by grazing. Grazed sections are in the north of the site with the exception of one in the south. Grazing is by cattle and sheep. Most areas are unfenced, the exceptions being those sections that are grazed. In addition, there are neglected fences, no longer stock-proof, round some currently unmanaged and mown sections.

Mowing is carried out in late July and August. Traditional hand turning and coling is carried out on at least one section. Otherwise the hay is turned by machine and baled on site where the ground is dry enough, or more frequently carted off to be baled on firmer ground nearby.

Figure 1. Typical wet grassland and mire vegetation in the central part of the site, looking north

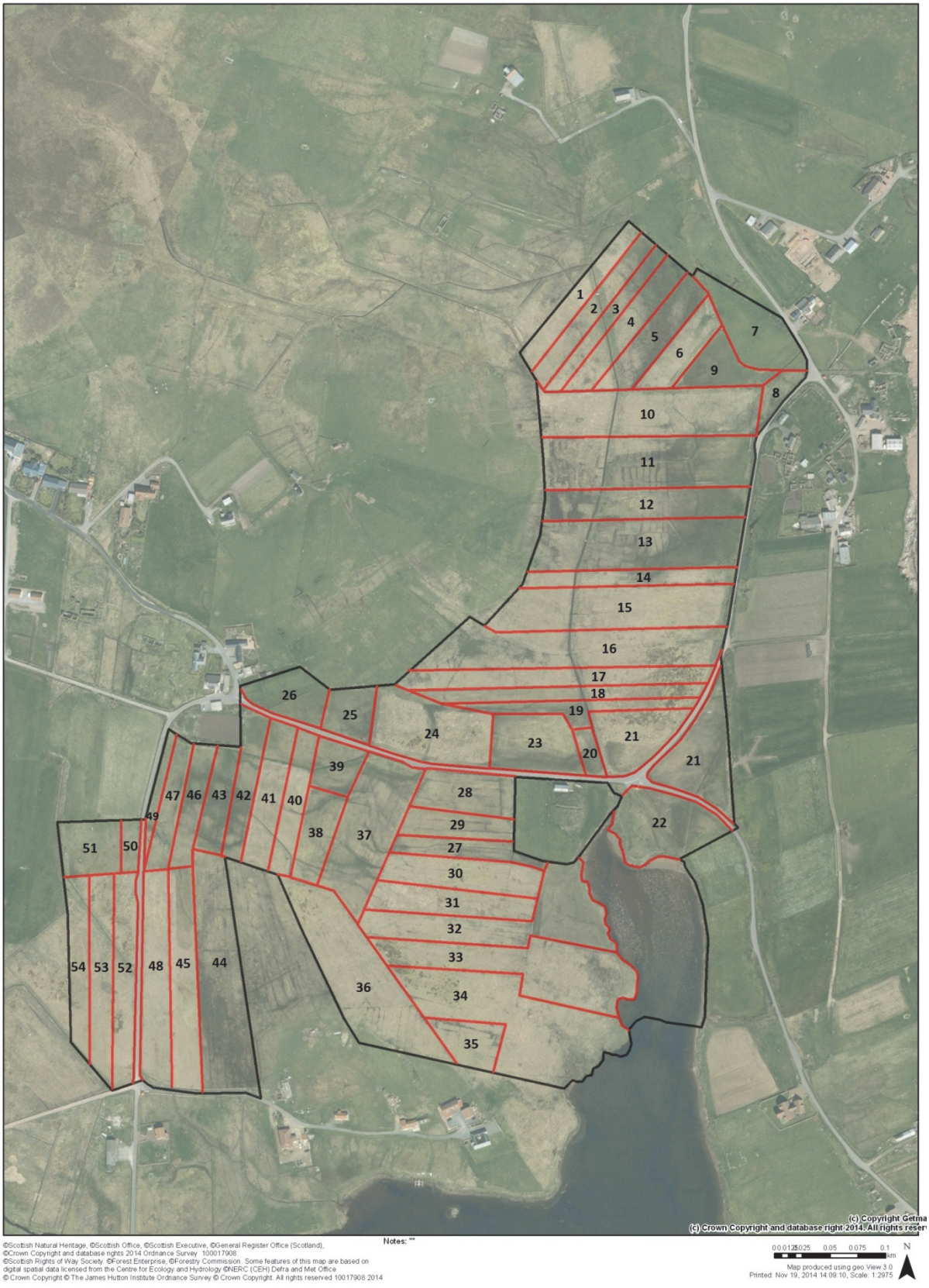

Figure 2. Map site showing land ownership parcels

2. OBJECTIVES

1. Carry out National Vegetation Classification (NVC), European Nature Information System (EUNIS) Annex 1 Habitat and survey and mapping.
2. Review where the two vegetation features of the site, lowland neutral grassland and fen meadow, currently occur.
3. Indicate any further transitional vegetation communities that are of ecological interest, and that could be considered as additional site features.
4. Advise how transitional plant communities and their biological interest may reveal how the site is changing with the reduction in active management over the past few years.
5. Advise on the next steps in terms of site management: prioritise areas for active management.
6. Advise as to the likely effect the overflowing of the central drainage ditch is having on the site and recommend what actions should be taken.

3. METHODS

3.1 NVC survey and mapping

Mapping of homogeneous units of vegetation (polygons) in the field was carried out using maps and copies of aerial photographs at a scale of c. 1:2500.

Sampling of vegetation types was carried out as recommended in the NVC Users' handbook (Rodwell, 2006). At least five samples were taken in the major vegetation types, where possible, to provide a constancy score of I-V (some vegetation types of scarce occurrence and/or peripheral to the basin were sampled fewer than five times). For some of the main types present it proved difficult to establish the NVC type and sampling was continued in order to achieve a larger data set for future analysis. Up to 12 samples were taken in the more problematic and widespread communities.

However, even at a scale of 1:2500 it was not possible to map homogeneous stands of single vegetation types as polygons on their own. Therefore many map polygons represent mosaics of different types, with one or two, rarely three, of these being the major components. The method used to represent this on the NVC map has been to list the component types of a polygon on a scale of 1–10, this representing approximately the proportion of ground covered by each type. In addition, significant vegetation of another type occurring at much less than 10% has been represented by adding it to the list in brackets without a cover value. For example, S27b/M5/(S10): 7, 3 indicates a polygon with c. 70% and 30% cover respectively of S27b and M5 in which S10 is also present at less than 10% cover. Boundaries between different vegetation types were often not clear-cut, but it was felt that the range of variation present was in nearly all cases adequately dealt with by the fine-scale of mapping; however, some recording of transitions, represented thus: S27b-M5, was unavoidable. One particular recurring transition (M6-M15) is discussed in the relevant section of this report.

Quadrat size was 2 x 2 m except in tall-herb and swamp where it was generally 4 x 4, but sometimes 2 x 2 m in shorter homogeneous vegetation. Species occurring in a quadrat were assigned cover and abundance scores in accordance with the DOMIN scale. Species noted outside but close to the quadrat and still within the sample stand were also recorded, using a plus (+) sign. Presence of plant litter was recorded, where it was obvious (DOMIN 5 and above), not as actual cover but as a visual assessment of litter not obscured by growing

plants. A 10-figure National Grid Reference (NGR) for every quadrat was recorded using a GPS device.[1]

Two digital photos were taken of nearly every quadrat,[2] one a close-up of the vegetation, the other a wider view, except in tall swamp and mire communities where a single photograph was sufficient. A compass bearing was recorded for the wider view or single photo. The photos in electronic form are held by SNH (see Annex 5 for list of data files supplementary to this report).

A small number of target notes were made (see Annex 4).

3.2 Data analysis

Quadrat data of vegetation communities were entered in tables in Microsoft Excel and matched to community and sub-community using the text and tables published in British Plant Communities (Rodwell (ed.), 1991, 1992, 1995, 2000). The data were sorted manually into apparently homogeneous groups. Problematic single samples and groups of samples were analysed using the 'TABLEFIT' programme (Hill, 2015). Results obtained thus were used critically as an aide to diagnosis. The data are summarised in synoptic tables contained in Annex 2. The complete raw data and essential details of all quadrats are contained in electronic files (see Annex 5). Quadrats recorded in managed parcels are labelled 'M' and in unmanaged parcels 'U' in these files.

Two species recorded during survey, *Agrostis vinealis* and *Festuca vivipara*, are represented by aggregates, respectively *Agrostis canina sens. lat*. and *Festuca ovina* agg. in the NVC quadrat synoptic tables in Annex 2 and in the complete quadrat data file. The published NVC tables for wet, more or less acidic communities include only A*. canina sens.strict*., but this species was not found during the survey and has not been recorded in Shetland at all. Instead, the closely related *A. vinealis* is common in wet, more or less acidic habitats throughout Shetland, including Aith. The reasons for this may be debated, but for the purpose of this survey the quadrat data gathered can be better compared to the published tables by aggregating the two species names under *Agrostis canina sens. lat*. Similar reasoning applies to the use of *Festuca ovina* agg. to represent *F. vivipara*: *F. vivipara* is common but *F. ovina sens strict*. has not been recorded in Shetland.

Some groups correspond well or reasonably well with an NVC type, but others do not. In these cases the TABLEFIT programme is not particularly useful, as it generates a number of alternative answers, often inappropriate, with low scores. Many problematic groups represent local particularities, accentuated by intensive sampling in a limited area. In the context of the broad national coverage of the NVC, these groups are within the range of variation to be expected and it is sensible to assign them to existing units of the classification and give reasons for doing so, though one exception has been made in this report, in

[1] However, it became apparent after the survey was completed, when NGRs were being plotted on a map, that there was a substantial, common error in the readings taken. It transpires that there is a known error with NGR readings taken with some widely used makes and models of GPS device, including the Garmin foretrex 401 used for this survey. This is in addition to the minor background inaccuracies to which the system is subject. The error is caused by an imperfect translation of Lat-long and WGS84 into British National Grid and is a feature of Garmin GPS devices. The error in Shetland is substantial - 14 m south and 3 m west of the same NGR on an OS map. Following consultation, the readings taken at Aith Meadows were corrected by SNH Geographic Information Group; these are in all cases the NGRs given in this report.

[2] Due to an oversight, there is no photograph of the SM28 *Elytrigia repens* salt-marsh community, of which there was one small patch.

identifying a sub-community variant. However a few groups may be viewed as provisional new units of the NVC. Three such have been identified in this survey; all are consistent with types already identified as occurring more widely in Scotland.

Reasoning in respect of particular provisional new types and variants is given in relevant sections of this report, but it is useful to summarise here the underlying considerations.

- Reviews carried out for JNCC (Rodwell *et al.*, 2000), SNH (Cooper & MacKintosh, 1996) and a more recent compilation of reports and recommendations by JNCC (Mountfort, 2011) have repeatedly drawn attention to variation and gaps at community and sub-community levels in the NVC and briefly described the vegetation concerned. Some of the problematic vegetation at Aith Meadows is comparable to some of the additional types described in the reviews.

- There are aspects of the Shetland flora, of consistent occurrence in the islands, which are unusual in comparison with the median of British vegetation. The cool oceanic climate, the effect of sea spray deposited in varying amounts over the entire archipelago and the isolation from the Scottish mainland are likely to be the chief reasons. For instance, *Empetrum nigrum* ssp. *nigrum* is almost ubiquitous in heaths, *Jasione montana* and *Scilla verna* often occur in acid grasslands, and as explained above, *Festuca ovina* is replaced by *F. vivipara* and *Agrostis canina sens. strict*. is absent. Such local particularities can make it difficult to reconcile local data with that in the published NVC tables.

- Little or no data used in the compilation of NVC community accounts and tables in Rodwell (ed.), (1991, 1992 & 1995) for lowland grassland, fen and swamp types came from Shetland or even the north of Scotland, so significant variation on a more than a narrowly local basis is to be expected.

3.3 Previous studies

The vegetation at Aith Meadows was examined, along with other Shetland 'hay meadows', by Jane Mackintosh of the NCC Scottish Field Unit in 1982 (Mackintosh, 1984) and in 1998 by Hutcheon (*op.cit.*). Mackintosh analysed vegetation types in some detail and interpreted them in the context of the NVC framework. Her focus was particularly on MG5 *Cynosurus cristatus-Centaurea nigra* grassland and MG8 *Cynosurus cristatus-Caltha palustris* grassland and on forms of non-NVC "wet hayfield" and "poor fen". Her instructive views, re-visited in Cooper & Mackintosh (1996), have largely been followed in describing the NVC units at Aith Meadows in this report. Some comparisons with the Hutcheon report, with regard to SSSI interest features and change in the vegetation, are made in section 5.

3.4 Plant records and nomenclature

A complete list of vascular plants was recorded - see Annex 3. Nomenclature for vascular plants follows Stace (2010) and for bryophytes Smith (2004).

3.5 EUNIS

NVC communities have been correlated with the EUNIS classification according to guidance in the SNH manual (Strachan, 2015 and 2016), with some additional advice on problematic communities from the author (pers. comm.).

4. HABITATS AND PLANT COMMUNITIES

4.1 Overview

Broadly, the site can be described as a mildly acidic fen. A gradation of habitat types extends from damp neutral and acidic grasslands, via inundation grassland and fen meadow to tall-herb fen and eventually swamp. In addition, there are more acidic mire and patches of unusual *Sphagnum*-dominated vegetation that probably represent a late stage in succession to wet heath or bog; other minor features comprise semi-improved grassland and saltmarsh.

Figure 3. View of the site from the north

Environmental patterning of vegetation is sometimes clear but more often rather subtle. A backdrop to almost all the vegetation is formed by a group of species comprising *Carex nigra, Eriophorum angustifolium, Potentilla erecta, Ranunculus acris, Silene flos-cuculi, Succisa pratensis, Equisetum palustre* and the grasses *Anthoxanthum odoratum*, *Festuca rubra* and *Holcus lanatus*. More contrast between habitats is provided by varying abundance of such species as *Caltha palustris, Comarum palustre, Menyanthes trifoliata* and the mosses *Hylocomium splendens, Sphagnum palustre and Rhytidiadelphus squarrosus.* Frequently though, there are combinations within small areas of species indicative of both mire and grassland, and of relatively neutral and acidic trophic status. In these circumstances, distinctions between the NVC types identified are often fine, and arguable; accordance with published descriptions is often poor. Nevertheless, within these constraints it is possible to identify five NVC and non-NVC units that characterise most of the site and a further 16 others.

An important point to make in this overview is on the differences between vegetation of essentially the same NVC communities as they occur in managed and unmanaged parcels. This applies particularly to the MG8, U4d grassland and provisional MGcn grassland/fen meadow communities. Managed areas are open and generally rich in forbs, especially rosette-forming species, while the unmanaged areas have much grass litter cover and relatively sparser forbs, though these effects may be obscured by local treatments, e.g. past agricultural improvements. A similar effect occurs in unmanaged areas of M6 mire, which have developed a thick mat of *Sphagnum*. The effect is much less in tall-herb fen and swamp.

What little dry-ish ground there is on the site is almost confined to the western edge south of the hamlet of Gord and to the opposite edge east of the old hall, also some parcels adjacent to road drainage ditches. Very locally, it has a cover of a form of mesotrophic grassland MG5c Cyn*osurus cristatus-Centaurea nigra* grassland, the *Danthonia decumbens* sub-community; this grades on more acid soils into U4d *Festuca ovina-Agrostis capillaris-Galium saxatile* calcifugous grassland, the *Luzula multifora-Rhytidiadelphus loreus* sub-community; all these are damper and include far more *Carex nigra* than would normally be expected for these NVC communities.

On wetter land, in the same locations and more widely, the MG5c grassland grades into vegetation identified as MG8 *Cynosurus cristatus-Caltha palustris* grassland, though of an unusual *Carex nigra*- and *Caltha palustris*-dominated form that may be viewed as fen meadow rather than inundation grassland. Vegetation related to MG8 (in its local form) but lacking *Caltha palustris* is very common across much of the site and is more typical of it than any other. It has proved impossible to allocate this to an existing unit of the NVC and for this report it is provisionally named MGcn *Carex nigra* grassland/fen.

Likewise on wetter land, U4d grassland grades into M6b *Carex echinata-Sphagnum fallax/denticulatum* mire, the *Carex nigra-Nardus stricta* sub-community. In unmanaged and long-neglected parcels *Sphagnum palustre* can be locally dominant, forming thick carpets, with *Carex nigra*, grasses and fen herbs scattered through. Locally, in some of the longest-neglected parcels, these carpets have developed a cover of *Empetrum nigrum* ssp. *nigrum* and *Deschampsia flexuosa*, in what appears to be a later stage of succession to some form of heath. This vegetation has been termed M6b-M15 mire/heath transition.

Molinia caerulea occurs widely but sparsely across the site and is consistently abundant only in one parcel. There it characterises M25 *Molinia caerulea-Potentilla erecta* mire, the flushed M25c *Angelica sylvestris* sub-community; other, smaller patches elsewhere are of the grassy M25b *Anthoxanthum odoratum* sub-community.

On still wetter ground, mostly in the northern part of the site, with an outlier at the far south, there is much S27b *Carex rostrata-Comarum palustre* tall-herb fen. *Carex nigra* and *Eriophorum angustifolium* are the abundant cyperaceous species here, rather than *C. rostrata*, which occurs only locally; this and the accompanying rather heterogeneous mix of swamp, poor- and rich-fen herbs indicates the S27b *Lysimachia vulgaris* sub-community. Occasionally, there is much *Sphagnum* in this sort of vegetation, indicating a shift to M5 *Carex rostrata-Sphagnum squarrosum* mire. In contrast, at the north-eastern edge of the site, more eutrophic conditions indicating soligenous influence from hills to the east support a form of tall-herb fen with combinations of *Equisetum fluviatile, Comarum palustre, Menyanthes trifoliata, Caltha palustris* and grasses. This does not correspond well with a published NVC type but is related to S27b tall-herb fen: it is here termed S27bi tall-herb fen. Very locally, still wetter ground supports swamp vegetation, in the form of S10 *Equisetum fluviatile* swamp and non-NVC *Iris pseudacorus* dominated mire or swamp, here referred to the *Iris pseudacorus-Filipendula ulmaria* mire.

Other communities present over very small areas comprise MG6 *Lolium perenne-Cynosurus cristatus* grassland, non-NVC MGfha *Festuca rubra-Holcus lanatus-Anthoxanthum odoratum* grassland, MG9 *Holcus lanatus-Deschampsia caespitosa* grassland, S28 *Phalaris arundinacea* tall-herb fen, all of these on site margins; M28 *Iris pseudacorus-Filipendula ulmaria* mire on site margins and ditch sides; and SM16 *Festuca rubra* and SM28 *Elytrigia repens* salt-marsh communities along the shore of Aith Voe.

4.2 NVC communities, EUNIS and Annex 1 habitats

Lists of the NVC, EUNIS and European Habitats Directive Annex 1 types found are provided in Annex 1.

The NVC communities and sub-communities briefly referred to in the preceding section are described in more detail in the following sub-sections. Each section is headed by the NVC community and corresponding EUNIS habitat, and, in one case only, Annex 1 habitat name.

Each sub-section begins with a brief description of the ecological setting of each community in a national context, with additional comments on the quality of the vegetation where this is useful for the subsequent sections. This is followed by a detailed description of the community as it is found on site, the reasons for assignment and some comparison between the published tables and recorded data. This should be read in conjunction with the relevant synoptic table given in Annex 2. Where the recorded form of the community is especially unusual or of a non-NVC type further reference is made to relevant NVC survey reports and reviews.

4.2.1 Mires

NVC: M5 *Carex rostrata-Sphagnum squarrosum* mire

EUNIS: D2.33 *Carex rostrata* quaking mires

Annex 1: H1740 Transition mires and quaking bogs

This mire is typically found on soft, spongy peats with mildly acid, only moderately calcareous and rather nutrient-poor waters. It is characterised overall by a dominance of sedges with scattered poor-fen herbs and moderately base-tolerant *Sphagna*.

The community occurs in two forms on the site, a single patch in parcel 11W that is a good match for the type, and uncommonly elsewhere in mosaics in transitional forms.

The 11W patch has *Carex rostrata, Comarum palustre, Aulacomnium palustre, Carex nigra, Eriophorum angustifolium* and *Succisa pratensis*, six of the seven constants, well represented, but lacks the seventh, *Sphagnum squarrosum*. *Menyanthes trifoliata* is frequent and locally abundant, with *Equisetum fluviatile* and lesser amounts of fen herbs. *Sphagnum palustre* is patchily abundant. *Sphagnum teres*, described as “especially distinctive” of the community (Rodwell (ed.), 1991) is occasional.

Elsewhere the community as identified here occurs in mosaics with S27 *Carex rostrata-Comarum palustre* tall-herb fen, Mx *Carex nigra* mire and wet forms of MG8 *Cynosurus cristatus-Caltha palustris* inundation grassland. *Comarum palustre*, *Menyanthes trifoliata* and *Sphagnum palustre* feature strongly, occasionally with other *Sphagna* including *S. subnitens*, along with *Carex nigra*, *Equisetum fluviatile* and fen herbs including *Silene flos-cuculi, Succisa pratensis* and *Viola palustris*. However, *Carex rostra* and the two most characteristic *Sphagna* are absent and there are grasses, grassland forbs and bryophytes such as *Antoxanthum odoratum*, *Festuca vivipara, Ranunculus acris* and *Rhytidiadelphus squarrosus*. The combination of *Carex nigra*, mildly base-tolerant *Sphagna* and swamp and fen herbs indicates M5 as the closest unit in the NVC, albeit in a transitional form.

NVC: **M6 *Carex echinata-Sphagnum fallax/denticulatum* mire, M6b *Carex nigra-Nardus stricta* sub-community**

EUNIS: **D2.22 *Carex nigra, Carex canescens, Carex echinata* fens**

This community is characteristic of peats and peaty gleys flushed by rather base-poor waters in upland and northern Britain. The M6b *Carex nigra-Nardus* sub-community is found on firmer ground, often among calcifugous hill grassland.

Figure 4. M6 *Carex echinata-Sphagnum fallax/denticulatum* mire, M6b *Carex nigra-Nardus stricta* sub-community

The M6b sub-community was identified. Here the sub-community is characterised by grasses, small sedges and varying abundance of fen herbs with *Sphagna*. *Eriophorum angustifolium, Carex nigra* and *C. echinata* are the commonest cyperaceous species, in that order; of the *Sphagna* only *S. palustre* is constant or abundant. The grasses *Anthoxanthum odoratum, Festuca vivipara* and *F. rubra* are prominent, often giving this vegetation the appearance of a flushed grassland, and quite a rich one with plentiful and sometimes abundant *Potentilla erecta, Succisa pratensis, Silene flos-cuculi, Dactylorhiza maculata, Equisetum palustre* and others. Of the bryophytes, *Aulacomnium palustre* is sparse and *Hylocomium splendens* can be plentiful; the latter, especially when joined by *Deschampsia flexuosa*, indicates an affinity with calcifugous grassland.

Most of the community constants and sub-community preferentials of M6b are well represented, including *Agrostis canina sens lat., Potentilla erecta, Molinia caerulea, Eriophorum angustifolium, Nardus stricta, Carex nigra,* and *Sphagnum palustre*. *Carex echinata*, *C. panicea*. *Viola palustris and Sphagnum denticulatum agg.* are under-represented. The frequency and patchy abundance of fen herbs, especially *Silene flos-cuculi* and *Succisa pratensis*, with the horsetail *Equisetum palustre* (and occasional *E. fluviatile*) are unusual for the community.

This is one of the vegetation types that differ greatly depending on whether it is cut annually for hay or has been neglected. In managed parcels the vegetation is rich in species and the *Sphagna* are low and patchy. In neglected parcels *Sphagnum palustre* can form thick carpets up to 60 cm deep, with just a scattering of herbs and horsetails. The latter form is not like the published form of M6 *Carex echinata-Sphagnum fallax/denticulatum* mire and could be seen as ombrotrophic nuclei forming amongst the overgrown fen meadow in which it occurs.

NVC: **M6-M15 Carex *echinata-Sphagnum fallax/denticulatum* mire – *Trichophorum germanicum-Erica tetralix* wet heath transition**

EUNIS: **D2.22 *Carex nigra, Carex canescens, Carex echinata* fens**

In this unusual transitional community abundant *Sphagnum palustre* and a similar but reduced array of herbs with *Equisetum palustre* and *E. fluviatile* indicate close similarity with the form of M6b described above; however, abundant *Empetrum nigrum* ssp. *nigrum,* occasional *Salix repens* and, rarely, very small amounts of *Calluna vulgaris* give the impression of a heath or bog – except there is no heath or bog like this described in the NVC. A few square metres of denser *Calluna vulgaris* were noted at one spot, indicating the transition tipping to M15 *Trichophorum germanicum-Erica tetralix* wet heath (see target note 08 and photo).

There is no equivalent in the EUNIS classification. It has been placed with M6 in the D2.22 habitat.

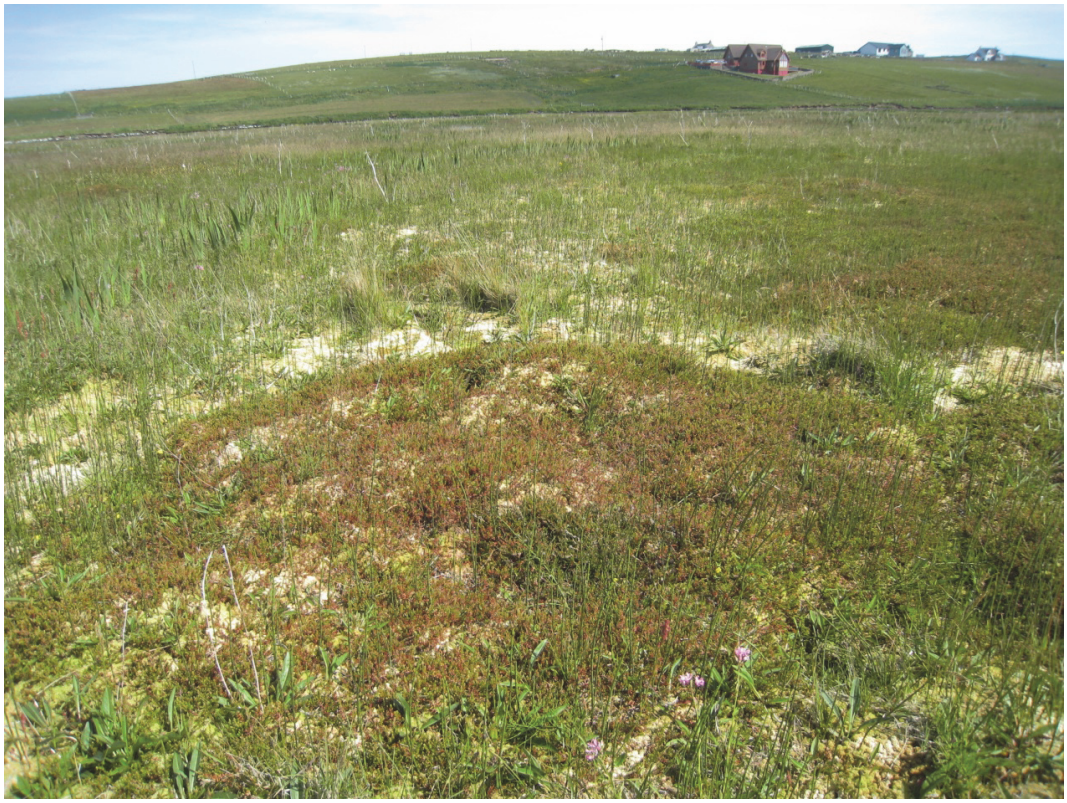

Figure 5. M6-M15 Carex *echinata-Sphagnum fallax/denticulatum* mire – *Trichophorum germanicum-Erica tetralix* wet heath transition, with abundant *Empetrum nigrum*

NVC: **M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture, M23b *Juncus effusus* sub-community**

EUNIS: **E3.41 Atlantic and sub-Atlantic humid meadows**

This rather ill-defined assemblage of tall rushes, poor-fen and wet grassland herbs is found on poorly-drained mineral soils where grazing pressure is heavy or where some past agricultural 'improvement' has modified the vegetation.

Juncus effusus is very scarce on the site as a whole but in a single stand it is prominent, with mesotrophic herbs comprising *Agrostis stolonifera, Festuca rubra, Holcus lanatus, Deschampsia cespitosa* and *Ranunculus acris,* together with fen herbs including *Carex nigra, Eriophorum angustifolium, Galium palustre Potentilla erecta* and *Ranunculus flammula.*

NVC: **M25 *Molinia caerulea-Potentilla erecta* mire**

EUNIS: **E3.512 Acidocline purple moorgrass meadows**

This mire is a community of moist but well aerated, acid-to-neutral peats and peaty mineral soils in the wet and cool lowlands of Britain. It encompasses vegetation of quite widely differing floristics but is characterised throughout by an abundance of *Molinia*. The grassy M25b *Anthoxanthum odoratum* sub-community is found on drier ground and is often kept short by grazing, but can become rank and tussocky where grazing is relaxed. The M25c *Angelica sylvestris* sub-community occurs on more irrigated and mildly base-enriched soils.

The **M25b *Anthoxanthum odoratum* sub-community** is found in just a few small stands in unmanaged parcels and is tussocky. *Molinia* is abundant to dominant with smaller amounts of *Potentilla erecta*. The accompanying species are a heterogeneous mixture of mire and calcifugous grassland herbs and bryophytes, including *Carex nigra*, *Comarum palustre*, *Galium palustre, Sphagnum palustre*, *Deschampsia flexuosa, Luzula sylvatica* and *Hylocomium splendens*. The sub-community constants *Anthoxanthum odoratum* and *Festuca rubra* and *Rumex acetosa* are present in small amounts.

The single stand of **M25c *Angelica sylvestris* sub-community** has an even sward of abundant *Molinia* with plentiful *Potentilla erecta* and *Carex nigra*, with lesser amounts of *Carex echinata, Equisetum palustre, E. fluviatile* and a variety of fen herbs including the sub-community preferentials *Angelica sylvestris, Epilobium palustre* and *Cardamine pratensis*. Plentiful *Rhytidiadelphus squarrosus* is not typical of the published type. Few of the sub-community preferentials are well represented but the mix of species indicates a wet, mildly flushed fen meadow and thus M25c.

NVC: **M28 *Iris pseudacorus-Filipendula ulmaria* mire, *J. effusus-J. acutiflorus* sub-community**

EUNIS: **E5.42 Tall-herb communities of humid meadows**

This community is especially characteristic of fresh-water seepage zones and is confined to moist, more nutrient-rich soils along the oceanic seaboard of Britain.

In the stands at Aith *Iris pseudacorus* is overwhelmingly abundant. A few tall stems of *Poa trivialis* and *Equisetum fluviatile* show among the iris, with some *Caltha palustris, Ranunculus acris, Rumex acetosa* below. Other herbs, including *Angelica sylvestris, Cardamine pratensis, Dactylorhiza purpurella* and *Epilobium palustre*, also occur sparsely.

Additionally, there is a single, almost pure, stand of *Iris pseudacorus* in a water-filled ditch. It is a swamp rather than a mire. Such vegetation has been observed elsewhere in Scotland (Rodwell *et al*., 2000) and probably cannot be assigned to a sub-community of M28. It is here provisionally named **M28x *Iris pseudacorus* species-poor sub-community**.

4.2.2 Grasslands

NVC: **MG5 *Cynosurus cristatus-Centaurea nigra* grassland, MG5c *Danthonia decumbens* sub-community**

EUNIS: **E2.112 Atlantic *Cynosurus-Centaurea* pastures**

This grassland community is typical of meadows on circumneutral soils in the lowlands of Britain. The *Danthonia* sub-community extends the range of the community into the uplands and onto calcium-deficient and locally damper brown earths.

Figure 6. MG5 *Cynosurus cristatus-Centaurea nigra* grassland, MG5c *Danthonia decumbens* sub-community

The community as identified at Aith Meadows is the first of three related types of neutral grassland and fen meadow, of particular importance as SSSI features, which cause problems of allocation to a recognised unit of the SSSI. This one is a rich mixture of grasses, sedges and forbs. No grass is dominant but all or most of *Agrostis capillaris, Anthoxanthum odoratum, Cynosurus cristatus* and *Festuca rubra* are prominent in the sward. *Carex nigra* is plentiful to abundant; the only other sedge present is *C. echinata*, which is frequent but not plentiful. *Succisa pratensis* is the most abundant forb; other plentiful species include *Equisetum palustre, Potentilla erecta, Ranunculus acris, Rhinanthus minor, Scorzoneroides autumnalis, Silene flos-cuculi* and *Trifolium repens*. Forbs more associated with drier grasslands - *Hypochaeris radicata, Plantago lanceolata, Trifolium pratense* - are occasional and generally sparse.

This sedge-rich grassland with generally sparse representation of drier grassland species and prominent damp grassland and fen herbs is an unusual form of MG5c; *Carex nigra* and *Silene flos-cuculi* are absent altogether from the tables in the published account, though the community description states that "Carices may be abundant in some stands …". Cooper and Mackintosh (1996) state that "greater frequency of such species [Carices including *Carex nigra*] in Scottish stands may be a reflection of higher levels of ground water through flushing causing minor shifts towards damper grassland communities such as the *Cynosurus-Caltha* grassland, MG8. Such stands can readily be incorporated into the *Danthonia decumbens* sub-community of the *Centaurea-Cynosurus* grassland, MG5c". It is unclear from this description whether stands with consistently plentiful *Carex nigra* should be included in the community, but the 1984 survey report on Shetland hay meadows (Mackintosh, *op.cit*.) suggests that they should (though this is unclear because the report contains no quadrat data). For these reasons it is sensible to include those small areas of damp, species-rich circumneutral meadow at Aith that have a consistent, albeit sparse, representation of species of drier grasslands, as well as much *Carex nigra* and fen meadow herbs, within MG5.

NVC: MG6 *Lolium perenne-Cynosurus cristatus* grassland, MG6b *Anthoxanthum odoratum* sub-community

EUNIS: E2.11 Unbroken pastures (in E2.1 Permanent mesotrophic pastures and aftermath-grazed pastures)

This is a permanent, productive pasture on neutral, free draining brown soils in much of Britain. It is grass-dominated, *Lolium perenne* being the most abundant species, with varying amounts of *Cynosurus cristatus* and others.

Here the community is represented by the *Anthoxanthum odoratum* sub-community. *Lolium perenne* and *Trifolium repens* are the most abundant species. Other grasses, comprising *Agrostis capillaris, Anthoxanthum odoratum, Holcus lanatus, Cynosurus cristatus* and *Festuca rubra*, make up most of the rest of the sward. The quantity and make-up of species varies with management, whether by grazing or hay cutting. *Bellis perennis* and *Plantago lanceolata* are abundant in grazed pasture; a variety of taller species, including *Phleum pratense, Conopodium majus* and *Rhinanthus minor* are plentiful in the somewhat richer hay-cut grassland.

Non-NVC: **MGfha provisional *Festuca rubra-Holcus lanatus-Anthoxanthum odoratum* grassland**

EUNIS: **E2.13 Abandoned pastures (in E2.1 Permanent mesotrophic pastures and aftermath-grazed pastures)**

This provisional new community in the NVC is described in Rodwell *et al.* (2000) as a species-poor element of marginal agricultural landscapes in western Britain and the Scottish isles.

Two small stands, mainly comprising the grasses *Festuca rubra, Holcus lanatus, Agrostis capillaris* and *A. stolonifera*, with some *Trifolium repens* and *Rumex acetosa*, suits the description. The presence of *Holcus mollis* in one is unusual in the Shetland context.

No quadrat data were recorded.

NVC: **MG8 *Cynosurus cristatus-Caltha palustris* grassland**

EUNIS: **E3.41 Atlantic and sub-Atlantic humid meadows**

This community is characteristic of periodically inundated land that has been treated in traditional fashion. It is a species-rich and varied grassland, with grasses accounting for most of the cover, the constant species being *Anthoxanthum odoratum, Festuca rubra, Holcus lanatus* and *Poa trivialis*. These are accompanied by a variety of mesotrophic grassland forbs. *Caltha palustris* is constant but not plentiful. Among the occasionals are a wide range of fen herbs. There are almost always some sedges in the sward.

Figure 7. MG8 *Cynosurus cristatus-Caltha palustris* grassland

At Aith, the community has frequent to abundant *Caltha palustris* and *Carex nigra* whilst grasses play a secondary role. *Caltha* is the most striking feature of the vegetation and

many other fen and damp grassland herbs are prominent, especially *Cardamine pratensis, Galium palustre, Potentilla erecta, Ranunulus acris, Silene flos-cuculi* and *Succisa pratensis*, all of which are constant. The grasses *Agrostis stolonifera, Anthoxanthum odoratum, Festuca rubra* and *Holcus lanatus* are constant but each is individually sparse. *Carex echinata, Eriophorum angustifolium* and *Equisetum palustre* are constant and locally plentiful. The only bryophytes occurring with any frequency are *Calliergonella cuspidata* and *Rhytidiadelphus squarrosus*. This is often rich vegetation, with up to 34 species recorded in one quadrat.

This form of *Cynosurus-Caltha* grassland has Carices, especially *C. nigra,* and fen herbs much more abundant than in the published table for the community. Conversely, some of the drier grassland constants and more plentiful associates in the published table, such as *Bellis perennis*, *Plantago lanceolata* and *Trifolium pratense* are absent or very scarce. *Cynosurus cristatus* is scarce and sparse. There is a question whether this vegetation should be assigned to MG8 or to new variation discussed in the NVC reviews already noted (Cooper & Mackintosh, 1996; Rodwell *et al.,* 2000; Mountford, 2011), which were foreshadowed by the Shetland hay meadow survey (Mackintosh, 1986). These have drawn attention to grasslands close to MG8 grassland but with frequent to abundant *Carex nigra* or *Juncus articulatus* and more resembling a fen. However, it has been decided to retain this vegetation within MG8, to follow Mackintosh (1986) and in order to distinguish it from other vegetation with abundant *Carex nigra,* grasses and fen herbs but little or no *Caltha,* which is described in the following section under the heading of the provisional MGcn *Carex nigra* grassland/fen community.

It should be noted that *Caltha palustris* also occurs with local abundance among tall-herb fens at this site. There it is accompanied by plentiful *Comarum palustre, Menyathes trifoliata* or *Equisetum fluviatile,* and combinations of these.

A final point is that this is one of the vegetation types that differs depending on whether it is managed, either by grazing or hay cutting, or has been neglected.

Non-NVC: MGcn provisional *Carex nigra* grassland/fen community

EUNIS: E3 Seasonally wet and wet grasslands

This vegetation at Aith has plentiful to abundant *Carex nigra* throughout, with constant *Anthoxanthum odoratum, Festuca rubra* and *Holcus lanatus*. *Cardamine pratensis, Equisetum fluviatile, E. palustre, Potentilla erecta, Ranunculus acris, Silene flos-cuculi* and *Succisa pratensis* are all plentiful throughout. *Carex echinata* and *Eriophorum angustifolium* are more locally plentiful. Other grasses occurring with some frequency are *Agrostis vinealis* and *Poa humilis*. *Angelica syvestris, Caltha palustris, Comarum palustre, Rumex acetosa*, are frequent but seldom more than sparse in occurrence. There is a little *Molinia caerulea* here and there and some other herbs scarcely distributed. *Rhytidiadelphus squarrosus* is the only bryophyte to occur with consistency.

This community cannot be placed in the existing NVC. The closest is the SD17 *Potentilla anserina-Carex nigra* dune slack community, which has abundant *Carex nigra* and a similar array of grasses and forbs. Vegetation of this sort, related also to other forms of mire with abundant *Carex nigra* and other sedges ('small-sedge mire') and to MG8 is not new and has been visited and re-visited in the various reviews already noted. A wet grassland or small-sedge fen is described (Rodwell *et al.,* 2000), similar to SD17 in which *Carex nigra* is often abundant with frequent *Agrostis stolonifera, Holcus lanatus, Ranunculus repens, R. acris, Caltha palustris, Silene flos-cuculi, Cardamine pratensis* and *Calliergonella cuspidata*, variously enriched by *Carex panicea* and poor-fen herbs, *Juncus articulatus* and Potentillion

plants (though not always *Potentilla anserina*) from damp hollows and wet pastures at low altitudes, especially along the western seaboard of Britain. The community at Aith resembles this, but the scarcity of *Agrostis stolonifera* and *Calliergonella cuspidata,* absence of *Ranunculus repens,* constant presence of *Potentilla erecta* and *Succisa pratensis* and occasional *Molinia*, in particular, are distinct differences.

This community is obviously related to the MG8 grassland already described and seems to occupy ground that is inundated for shorter periods. It is also a little more calcifugous and occurs in mosaics with M6 *Carex echinata-Sphagnum denticulatum* agg. mire. It occurs also in mosaics with S27 *Carex rostrata-Comarum palustre* tall-herb fen, but is generally well marked off from that by a scarcity of *Comarum palustre* and absence of *Menyathes trifoliata*.

Figure 8. MGcn provisional *Carex nigra* grassland/fen community

This is more a fen meadow than an inundation grassland.

This is another of the vegetation types that differs depending on whether it is managed, either by grazing or hay cutting, or has been neglected.

This community has been assigned to EUNIS level 2 category ‘E3 Seasonally wet and wet grasslands’, following guidance in the as-yet-unpublished revised edition (Strachan, 2016) of the EUNIS report (Strachan, 2015), and correspondence with the author of that report (Strachan, pers. comm.). This category comprises E3.4 ‘Moist or wet eutrophic and mesotrophic grassland’ and E3.5 ‘Moist or wet oligotrophic grassland’.

NVC: **MG9 *Holcus lanatus-Deschampsia cespitosa* grassland, MG9a *Poa trivialis* sub-community**

EUNIS: **E3.41 *Atlantic and sub-Atlantic humid meadows***

This community is characteristic of permanently moist, gleyed and periodically inundated circumneutral soils throughout the British Isles.

Here, in a single stand, *D. cespitosa* is dominant. It is accompanied by the grasses *Agrostis capillaris, Anthoxanthum odoratum* and *Festuca rubra* and a few forbs including *Potentilla erecta, Rumex acetosa* and *Succisa pratensis*.

NVC: **U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, U4d *Luzula multiflora-Rhytidiadelphus loreus* sub-community**

EUNIS: **E1.72 Agrostis-Festuca grassland (E1.72x Other Agrostis-Festuca grassland)**

This grassland occurs extensively on better-drained, more base-poor mineral soils through the cool and wet uplands of Britain. The U4d sub-community is found on damper soils and is characteristic of the colder and wetter upland parts of north and west Britain.

The community is characterised in the survey area by the grasses *Anthoxanthum odoratum*, *Agrostis vinealis* and *Festuca vivipara*, with *Carex nigra* and plentiful forbs, especially *Potentilla erecta* and *Succisa pratensis*. *Galium saxatile* is constant in small quantities. There is often a little *Carex echinata* and *Molinia caerulea* and in some stands *Deschampsia cespitosa*, a sub-community preferential, is patchily plentiful. However, the most distinctive feature is an abundance of *Hylocomium splendens*. An unusual feature is the occasional occurrence of *Jasione montana* and *Scilla verna*.

4.2.3 Swamps and tall-herb fens

NVC: **S10 *Equisetum fluviatile* swamp, S10b *Carex rostrata* sub-community**

EUNIS: **C3.24 Medium-tall non-graminoid swamp communities**

This community is characteristic of shallow standing water, over a range of nutrient conditions, in the lowlands and uplands of Britain. It also occurs around the margins of pools in zonations with S19 *Eleocharis palustris* swamp and S27 *Carex rostrata-Comarum palustre* tall-herb fen. The S10a Equisetum sub-community is species-poor and the S10b *Carex rostrata* sub-community has a more varied understorey beneath the horsetail and sedge canopy.

The community at Aith is characterised by abundant *Menyanthes trifoliata* with some *Comarum palustre* and *Equisetum fluviatile* and little else besides a scattering of *Carex nigra* and herbs including *Caltha palustris* and *Galium palustre*. There is no *Carex rostrata*.
This combination makes it difficult to ascribe this vegetation to one or other of two published NVC communities, S10 *Equisetum fluviatile* swamp or S9 *Carex rostrata* swamp. The S10 *Equisetum fluviatile* swamp appears the more appropriate, though the sub-community with much *Menyanthes* and *Comarum*, the S10b *Carex rostrata* sub-community, usually has plentiful *C. rostrata*. The alternative, the S9 *Carex rostrata* swamp, in particular the S9b *Menyanthes trifoliata-Equisetum fluviatile* sub-community, has a comparable mix of species but is dominated by *C. rostrata*.

NVC: ***S27 Carex rostrata-Comarum palustre*** **tall-herb fen**

EUNIS: **D2.39 *Menyanthes trifoliata* and *Potentilla palustris* rafts**

This community is characteristic of fens over peat or peaty gley soils where a pattern of seasonal flooding maintains the water at or just below the ground surface for much of the time. The vegetation is free of lengthy inundation in the growing season. Conditions are sufficiently base-rich to inhibit development of a *Sphagnum* carpet. In the S27b sub-community *Eriophorum angustifolium* or *Carex nigra* can replace *Carex rostrata* as the dominant, or share dominance.

S27b Lysimachia vulgaris **sub-community**

The community in the survey area has *Carex nigra* and *Eriophorum angustifolium* as the constants with *Carex rostrata* occurring only locally. These species are always accompanied by mixtures of *Comarum palustre*, *Equisetum fluviatile and Menyanthes trifoliata. Agrostis stolonifera, Anthoxanthum odoratum, Holcus lanatus, Juncus articulatus, Equisetum palustre, Galium palustre* and *Silene flos-cuculi* are frequent or constant in small quantities. An unusual feature of some stands is a thin cover of *Salix repens* sprawling over the herbaceous mat. The only bryophyte present with any frequency is *Calliergon cordifolium.*

Figure 9. S27 *Carex rostrata-Comarum palustre* tall-herb fen, S27b *Lysimachia vulgaris* sub-community

The pattern of species occurrence and dominance points fairly clearly to the S27b sub-community, where *Carex nigra* or *Eriophorum angustifolium* may replace *Carex rostrata* as the characteristic sedges, the only anomalous element being constant *Equisetum fluviatile*, which is a feature of the S27a *Carex rostrata-Equisetum fluviatile* sub-community.

S27bi 'Mixed fen' variant
Along the soligenous northeast edge of the site there is a broad band of tall-herb vegetation characterised by abundant *Equisetum fluviatile* and *Caltha palustris* with constant *Agrostis stolonifera, Anthoxanthum odoratum, Carex nigra, Eleocharis palustris, Epilobium palustre, Holcus lanatus, Persicaria amphibia* and *Poa trivialis*. Some of these can be patchily abundant, as can *Comarum palustre*. Associates mainly comprise wet grassland species. There is a little *Calliergon cordifolium*. One suspects that disturbance and enrichment has affected the vegetation here.

The place of this vegetation in the NVC is not clear. The combination of swamp and wet grassland species, *Carex nigra,* frequent *Comarum palustre* and occasional *Menyanthes trifoliata* suggests S27b as the closest grouping.

NVC: S28 *Phalaris arundinacea* tall-herb fen, S28c *Elymus repens-Holcus lanatus* sub-community

EUNIS: C3.26 *Phalaris arundinacea* beds

This community is typical of the margins of standing and running water, with fluctuating water levels. Stands have a summer water-table that is below the surface for most of the season. The grassier vegetation of the S28c *Elytrigia-Holcus* sub-community is more characteristic of drier situations.

Stands of this community at Aith comprise dense growth of *Phalaris arundinacea* with some *Iris pseudacorus.* Other species present in small amounts include *Angelica sylvestris, Cirsium palustre, Equisetum palustre, Holcus lanatus, Poa trivialis and Rumex acetosa.* Scattered bryophytes include *Calliergonella cuspidata, Kindbergia praelonga* and *Brachythecium rutabulum*.

Unfortunately no quadrat data for this community was recorded during the survey.

4.2.4 Maritime communities

NVC: SM16 *Festuca rubra* salt-marsh, SM16b sub-community with *Juncus gerardii* dominant

EUNIS: A2.53 Mid-upper saltmarshes

This is the predominant community of mid- and upper salt-marsh.

The community is found as a discontinuous, narrow fringe to the shore of Aith Voe, locally extending inland for some distance where there is frequent saltwater flooding. *Juncus gerardii* is dominant in shoreline stands, less so inland, with plentiful *Festuca rubra, Agrostis stolonifera* and *Triglochin maritimum*. *Angelica sylvestris, Rumex acetosa* and *Trifolium repens* are frequent inland

NVC: SM28 *Elytrigia repens* salt-marsh community

EUNIS: A2.51 Saltmarsh driftlines

This community is characteristic of upper salt-marsh areas where there is often a combination of disturbance, drift-line deposition and some freshwater influence.

A single stand by the shore of Aith Voe has dominant *Elytrigia repens* with plentiful *Festuca rubra* and some *Agrostis stolonifera,* with other mesotrophic grassland species sparse and a little *Triglochin maritima* and *Atriplex prostrata* agg.

4.2.5 Vascular plant species

Annex 3 lists the 124 species and hybrids of vascular plant that were recorded within the site boundary. There are no notable additions to previous site lists.

5. DISCUSSION AND RECOMMENDATIONS

5.1 SSSI interest features

It is clear from the foregoing that much of the vegetation described at Aith Meadows does not conform well to published descriptions of NVC communities. This applies especially to the SSSI biological interest features 'Lowland neutral grassland' and 'Fen meadow'. Definitions of these SSSI features, and future Site Condition Monitoring (SCM), will need to take account of their local character.

5.1.1 Comparison with the 1998 NVC survey

Another issue with future SCM will be difficulties in comparing the findings of the 2016 NVC survey with that of Hutcheon in 1998, without knowing to what extent these arise from different interpretations of problematic vegetation and their representation on NVC maps, or from real change over time. The findings are significantly different and it is fairly clear that most of the differences are due to interpretation. This is evident from examination of NVC community quadrat data and synoptic tables in the 1998 report: some given different names are in fact very similar in species composition to those in the current report, and might be re-organised to give a closer agreement. The background to this can be found of course in Hutcheon's statement that "the area turned out to hold a complex mosaic of vegetation, none of which corresponded particularly closely with the published descriptions and tables", which is perhaps slightly exaggerated but nevertheless foreshadows the experience of this surveyor. In this respect the current survey has had the advantage of being able to draw on guidance contained in the reviews of the NVC carried out since 1998 and other expert advice. This is not to say that there have not been some real changes in the vegetation, and in the areas and distribution of some NVC communities, since 1998: there probably have. Comparisons with Hutcheon's findings in respect of individual communities are included in the following sections.

Differences in NVC interpretation are exacerbated by different methods of representing communities on maps produced in the two surveys, so close comparison of these is difficult. The polygons on Hutcheon's NVC map often (but by no means always) coincide with crofting management parcels: it appears in these cases that Hutcheon was representing the NVC communities to be found within each of the parcels, usually by mosaics (but with relative cover undefined in a fairly broad-brush approach). The current survey mapped NVC

communities irrespective of management parcels; the results should better reflect ecological boundaries, while defined cover values are more informative; in any case the NVC polygons can be viewed superimposed on a map layer that shows management parcels.

5.1.2 Lowland neutral grassland

Lowland neutral grassland as defined in the Common Standards Monitoring guidance for SSSIs (JNCC, 2004) forms part of the 'Lowland Meadows and Upland Hay Meadows' habitat, comprising, among others, NVC communities MG5 *Cynosurus cristatus-Centaurea nigra* grassland and MG8 *Cynosurus cristatus-Caltha palustris* grassland. (The other component communities, MG3 and MG4, are of no concern here.)

The habitat continues as an interest feature at Aith, with an area slightly less than that of the 1998 survey. The component communities MG5 and MG8 are situated almost entirely in the central part of the site on gleys and thinner peat. Future SCM will need to take account of the local character of MG5c as a damp, sedge-rich form of the community and MG8 as a wet, sedge-rich form.

The 2016 synoptic data for MG5 shows less *Cynosurus cristatus* and more *Carex nigra* present than in 1998, indicating change towards a wetter community. This reflects that fact that MG5 as identified in the current survey is close to the MGcn provisional *Carex nigra* grassland/fen community. The area identified as MG5 is slightly less than in 1998, due, it is thought, to a combination of real change and interpretation of NVC community. With regard to mapping of particular areas of MG5 in 2016, about half (parcels 47 & 49) are much the same as they were in 1998. Elsewhere, one former area (in 15E) is now MG9 *Holcus lanatus-Deschampsia cespitosa* grassland and MGcn *Carex nigra* grassland/fen, and one (in 17W & 18W) is now in an intermediate and mosaic including MGcn. Another area (32E) mapped as U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland in 1998 is now identified as MG5.

There was generally good correspondence in mapping areas of MG8 in the two reports, with the exception of a 1998 area (11E, 12E & 13E) now identified as the unusual S27 *Carex rostrata-Comarum palustre* tall-herb fen, S27bi 'Mixed fen' variant, (with *Caltha palustris* and tall-herb and swamp species). There is no quadrat data from 1998 with which to make comparison.

5.1.3 Fen meadow

'Fen meadow' as defined in the JNCC guidance can form part of either the Lowland grassland or Lowland wetland habitat but as an interest feature in its own right, as here, it is monitored as a component of Lowland grassland 'Lowland purple moor grass and rush pastures', which includes M25 *Molinia caerulea-Potentilla erecta* mire. (The other component communities of that habitat, M22-M24 and M26, are of no concern here.)

Little M25 *Molinia-Potentilla* mire was found during this survey, nor, in retrospect, much unequivocal M25 in the 1998 survey. Much of the extent of the fen meadow feature has hitherto been based on the 1998 finding of an M25b-Cn *Carex nigra* variant in which "*Carex nigra* replaced *Molinia caerulea* in what was otherwise a rather similar plant assemblage [to M25b]". This is now interpreted as the provisional MGcn *Carex nigra* grassland/fen community; there is generally good correspondence between the two surveys in the areas of these. The 1998 survey also identified a "CA *Carex nigra-Agrostis stolonifera* provisional type (Cooper & MacKintosh 1996)" mapped as 'CA Cp-Fu', including mosaics, occupying large blocs in the north of the site. This also is now interpreted as the provisional MGcn

Carex nigra grassland/fen community, with partial correspondence in cover in these areas, though some is now identified as S27 *Carex rostrata-Comarum palustre* tall-herb fen.

Taking into account the above new interpretation of the vegetation, in terms of NVC and interest feature, the area of the feature will be greater than that of the 1998 survey. It is widely distributed across the site with concentrations in the central and southern parts.

This distinctive vegetation, with its mixtures of sedges, grasses and grassland and fen herbs is surely best categorised as a fen meadow. Future SCM will need to incorporate site-specific criteria for the feature.

5.2 Additional interest feature – valley fen

Valley fen is not currently an interest feature but it should be considered as an additional one.

The northern part of the site is a valley fen with a high groundwater level and little through-flow, hence a sump wetland. Some component communities of sump wetland are M5 *Carex rostrata-Sphagnum squarrosum* mire, S10 *Equisetum fluviatile* swamp and S27 *Carex rostrata-Potentilla palustris* tall-herb fen: all of these occur. S27 in particular occupies a large area, is generally species-rich and shows a range of variation dependent on the differing patterns of water supply and management. The small area of M5 (an Annex 1 habitat) among the S27 probably represents incipient development of ombrotrophic vegetation. It is possible that more M5 will develop. S10 is another minor feature representing further variation.

Isolated areas of S27 occupy depressions in the southern part of the site, outside of the valley fen. They represent variation within the fen meadow in that area.

Comparison between the 1998 NVC map of the northern part of the site and the current one indicates an apparent increase in the area of S27 tall-herb fen, at the expense of the CA *Carex nigra-Agrostis stolonifera* provisional type and the 'M25b-Cn *Carex nigra* variant' of the 1998 report (now reinterpreted as MGcn *Carex nigra* grassland/fen). The precise area of M5 *Carex rostrata-Sphagnum squarrosum* mire in 1998 is unknown because it was then mapped as part of a mosaic with S27 tall-herb fen. The identification of M9 *Carex rostrata-Calliergonella cuspidata/Calliergon giganteum* mire in the 1998 report can be discounted: it was based on an area of S27-M9 intermediate, with quadrat data included in the S27 synoptic table, characterised by heterogeneous tall-herb vegetation with *Caltha palustris* and occasional *Calliergon giganteum*. However, the bryophytes characteristic of M9 are quite absent from the table, with the exception of *C. giganteum*, which on its own is very unlikely and almost certainly represents a misidentification of *Calliergon cordifolium*, a common swamp bryophyte. Roughly the same area is now mapped as S27 *Carex rostrata-Comarum palustre* tall-herb fen, S27bi 'Mixed fen' variant.

The small area of S10 *Equisetum fluviatile* swamp in 1998 is reduced, with part now identified as a swamp form of M28 *Iris pseudacorus-Filipendula ulmaria* mire, the M28x species-poor sub-community.

5.3 Secondary interest feature – mire-wet heath

In contrast to the impoverished, littered forms of grassland and fen meadow resulting from land falling out of use, the parallel development in more acidic habitats of *Sphagnum*-dominated mire and *Sphagnum*-with-*Empetrum nigrum* mire-heath named M6-M15 Carex

echinata-Sphagnum fallax/denticulatum mire – *Trichophorum germanicum-Erica tetralix* wet heath transition is of more interest. The M6 mire-M15 wet heath community appears to have developed over approximately 50 years in the absence of any management and to represent the last stage of succession over that period of time. It is characterised by abundant *Sphagnum palustre* pricked through with fen herbs and horsetails, with an additional layer of *Empetrum nigrum* and often *Deschampsia flexuosum*. *Salix repens* is found in some stands, and, rarely, *Calluna vulgaris*. It is unclear what shape further development of vegetation will take.

In the 1998 report this vegetation appears to be part of a broader concept of M6 *Carex echinata-Sphagnum fallax/denticulatum* mire, M6b *Carex nigra-Nardus stricta* sub-community. *Empetrum nigrum* is mentioned in the description of the community and included in the synoptic table, but *Calluna vulgaris* is not.

5.4 Continuing vegetation change

If the M6 mire-M15 wet heath community represents the latest stage in succession in more acidic habitats, then the precursor is almost certainly the carpets of *Sphagnum palustre* with sparse herbs and horsetails but no woody plants (assigned to the M6 *Carex-Sphagnum* mire community) – which occur quite commonly in the central and southern parts of the site. What is less clear is whether this kind of vegetation has developed, in the absence of management, only from managed forms of more herb-rich *Carex-Sphagnum* mire or from other forms of vegetation altogether, especially the MGcn grassland/fen. The suspicion is that it has developed from both. The role of *Sphagnum palustre* is key in this; in the Shetland climate it may thrive in a greater variety of habitats than further south in Britain. If so, the *Sphagnum* carpets are likely occupy an increasing area if active management is not continued or resumed.

5.5 Management recommendations

Obviously, the site needs to be managed appropriately if favourable condition is to be maintained, or restored in many areas where management has ceased and mats of litter have built up. Continuation or re-instatement of traditional management is the ideal; however, the trend is in the opposite direction – for traditional practices to fall away and more land to go out of use. To address this situation, a number of approaches and associated measures are suggested: they comprise facilitation of traditional management; prioritisation of vegetation communities for management; and livestock grazing.

5.5.1 Facilitation

The main drain of the northern part of the site, the Burn of Aith, should be kept clear: without this, any kind of positive management in this part of the site will become increasingly difficult. It is unlikely, since the site is almost level and underlain by deep peat, that this will have significant effect on the quality of the vegetation. Selected minor drains here and elsewhere should also be cleared, but only where tied to management of priority areas.

Potential problems of access to some areas, particularly in the southeast of the site, caused by ditches and, it is guessed, access across lands in multiple ownership, should be addressed.

Acquisition of specialised machinery for working on very wet land should be investigated.

5.5.2 Prioritisation

Parcels dominated by the MG5 grassland, MG8 inundation grassland, MGcn *Carex nigra* grassland/fen, U4 grassland and to a lesser degree M6 mire are the priorities for management. Parcels of these communities in the central part of the site are mainly already managed, but there are gaps, notably 40S and 41S (where access across ditches may be a problem). Elsewhere, in the southwest and southeast of the site there are large areas of these communities unmanaged, notably parcels 30, 31, 32, 33E, 34E, 36, 45, 52S, 53S and 54S. 32E is a particular priority as an area of MG5 that has recently fallen out of use.

In general, S27 tall-herb fen requires little management to maintain it in favourable condition (see SNH Fen Management Handbook, 2011). This is not to say that traditional management and appropriate grazing should not be encouraged and facilitated over most of this area, but it is less of a priority than the drier communities. At the far northwest of the site, parcels 1W, 2W, 3W, 4W, 5W, 10W, 11W and 12 W have had little or no management for many years, resulting in growth of *Salix repens* in some of them and local development of M5 mire; these should be left unmanaged or at most very lightly grazed.

The M6-M15 mire-heath transitional community should be retained without management intervention. Priority areas are parcels 16E, 17E, 18E, 19E and 21W (part not hay-cut), 24 (part not hay-cut) and 52S, 53S and 54S.

5.5.3 Livestock grazing

Grazing will not be as efficient as hay cutting in taking off excess vegetation and preventing litter build-up on such a wet site; however, there is some grazing on site already that is apparently effective. There are potential drawbacks to be avoided.

- Stocking levels need to be set appropriately (see Fen Management Handbook, 2011). If too high, livestock will be forced into very wet areas in search of forage and will move continually about the site, both causing unacceptable levels of poaching. Under-stocking will of course be ineffective in controlling vegetation, but is safer, at least until correct grazing levels are established.
- Livestock need access to dry areas for lying and to forage of adequate quality. Depending on the wetness of the site and quality of the vegetation, this may be achievable only by livestock having access to land off-site.
- Livestock, especially cattle, need a water supply. This cannot be solely from wet parts of the fen and ditches, thereby causing poaching, though it may suffice for sheep.
- Overgrown areas may need an initial cut before grazing commences.
- A desired summer stocking level can be achieved by a low rate for a long period or a heavier rate for a shorter period. The former is generally preferable, especially over large areas of land with mixed wet and dry parts, though it may not be possible in practice. The latter may be employed in late summer if ground conditions permit.
- Winter stocking with sheep may be effective, but even sheep can poach and need careful management.
- It is not necessary to manage in the same way every year. Flexibility allows re-assessment and adjustment of grazing management, and response to varying weather and ground conditions. It would be possible, for instance, to cut in some years and graze in others.

Two contrasting examples of current grazing management at the site are instructive.

- Cattle graze parcels 2-5, mostly S27 tall-herb fen at the northern end of the site, in late summer, having access to them from a field of dry, improved grassland. Vegetation on the drier parts of the parcel has been noticeably controlled, on the wetter parts rather little and there is little sign of poaching. This is well-managed cattle grazing.
- It is apparent that sheep have been grazing parcel 44 in the south of the site, with mixed results. Litter build-up has been prevented, but this is the only parcel with, locally, thickets of *Juncus effusus* - an undesirable effect of grazing and poaching, probably in winter.

5.6 Effects of flooding

The question is asked – what is the likely effect of increased flooding of the area round the Burn of Aith? Winter flooding coinciding with high rainfall periods, no doubt exacerbated by backing up of the Burn of Aith at high tides, will have little effect on vegetation types. Lengthier periods of flooding coupled with generally poorer drainage will extend areas of wetter types, e.g. more S10 swamp, S27 tall-herb fen and MG8 inundation grassland at the expense of drier types. Comparison between the NVC maps of the 1998 survey and this one appear to show no significant change in this respect, though, as noted above, differences in identification of non-NVC and transitional communities and style of mapping make direct comparison difficult. On examination of quadrat data the only significant change detected is a reduction since 1998 in frequency and abundance of *Cynosurus cristatus* and increase in *Carex nigra* in MG5, which does indicate wetting of this community.

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ANNEX 1: NVC COMMUNITIES, EUNIS AND ANNEX 1 HABITATS RECORDED

NVC-EUNIS code correspondence		
NVC code	NVC community name	EUNIS code
M5	*Carex rostrata-Sphagnum squarrosum* mire	D2.33
M6b	*Carex echinata-Sphagnum fallax/denticulatum* mire, *Carex nigra-Nardus stricta* sub-community	D2.22
M6-M15	M6 *Carex echinata-Sphagnum fallax/denticulatum* mire/M15 *Trichophorum germanicum-Erica tetralix* wet heath intermediate community	D2.22
M23b	*Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *Juncus effusus* sub-community	E3.41
M25b	*Molinia caerulea-Potentilla erecta* mire, *Anthoxanthum odoratum* sub-community	E3.512
M25c	*Molinia caerulea-Potentilla erecta* mire, *Angelica sylvestris* sub-community	E3.512
M28a	*Iris pseudacorus-Filipendula ulmaria* mire, *Juncus effusus-J. acutiflorus* sub-community	E5.42
MG5c	*Cynosurus cristatus-Centaurea nigra* grassland, *Danthonia decumbens* sub-community	E2.112
MG6b	*Lolium perenne-Cynosurus cristatus* grassland, Anthoxanthum odoratum sub-community	E2.11
MG8	*Cynosurus cristatus-Caltha palustris* grassland	E3.41
MG9a	*Holcus lanatus-Deschampsia cespitosa* grassland, *Poa trivialis* sub-community	E3.41
U4d	*Festuca ovina-Agrostis capillaris-Galium saxatile grassland, Luzula multiflora-Rhytidiadelphus loreus* sub-community	E1.72
S10b	*Equisetum fluviatile* swamp*, Carex rostrata* sub-community	C3.24
S27b	*Carex rostrata-Comarum palustre* tall-herb fen, *Lysimachia vulgaris sub-community*	D2.39
S28c	*Phalaris arundinacea* tall-herb fen, *Elymus repens-Holcus lanatus* sub-community	C3.26
SM16b	*Festuca rubra* salt-marsh, sub-community with *Juncus gerardii* dominant	A2.53
SM28	*Elytrigia repens* salt-marsh community	A2.51

Non-NVC		
MGfha	Provisional *Festuca rubra-Holcus lanatus-Anthoxanthum odoratum* grassland	E2.13
MGcn	Provisional *Carex nigra* grassland/fen	E3
M28x	Provisional *Iris pseudacorus-Filipendula ulmaria* mire, species-poor sub-community	E5.42
S27bi	*Carex rostrata-Comarum palustre* tall-herb fen, ‘mixed fen’ variant	D2.39

EUNIS-NVC-code correspondence		
EUNIS code	EUNIS habitat name	NVC code
A2.53	Mid-upper saltmarshes	SM16b
A2.51	Saltmarsh driftlines	SM28
C3.24	Medium-tall non-graminoid swamp communities	S10b
C3.26	*Menyanthes trifoliata* and *Potentilla palustris* rafts	S28c
D2.22	*Carex nigra, Carex canescens, Carex echinata* fens	M6b
D2.22	*Carex nigra, Carex canescens, Carex echinata* fens	M6-M15
D2.33	*Carex rostrata* quaking mires	M5
D2.39	*Menyanthes trifoliata* and *Potentilla palustris* rafts	S27b
E1.72	*Agrostis-Festuca* grassland (E1.72x *Other Agrostis-Festuca grassland*)	U4d
E2.11	Unbroken pastures (in E2.1 Permanent mesotrophic pastures and aftermath-grazed pastures)	MG6b
E2.112	Atlantic *Cynosurus-Centaurea* pastures	MG5c
E3.41	Atlantic and sub-Atlantic humid meadows	MG8
E3.41	Atlantic and sub-Atlantic humid meadows	MG9a
E3.41	Atlantic and sub-Atlantic humid meadows	M23b
E5.42	Tall-herb communities of humid meadows	M28a
E3.512	Acidocline purple moorgrass meadows	M25b
E3.512	Acidocline purple moorgrass meadows	M25c

Non-NVC		
D2.39	*Menyanthes trifoliata* and *Potentilla palustris* rafts	S27bi
E2.13	Abandoned pastures (in E2.1 Permanent mesotrophic pastures and aftermath-grazed pastures)	MGfha
E3	Atlantic and sub-Atlantic humid meadows	MGcn
E5.42	Tall-herb communities of humid meadows	M28x

Annex 1-EUNIS code-NVC-code correspondence		
EUNIS code	Annex 1 habitat	NVC code
D2.33	H1740 Transition mires and quaking bogs	M5

ANNEX 2: NVC COMMUNITY TABLES

Tables have frequency classes and abundance values arranged in columns for the species, with the exception of tables that summarise fewer than three samples, for which frequency scores have not been calculated.

'Frequency' refers to how often a plant is found in samples, irrespective of how much of that species is present. This is summarised in the tables as classes denoted by the Roman numerals I to V:

Frequency	Class
1-20% (i.e. up to one sample in five)	I
21-40%	II
41-60%	III
61-80%	IV
81-100%	V

Frequency classes have been calculated for tables that comprise three or more samples.

Abundance is recorded using the Domin scale:

Cover	Domin
91 -100%	10
76 - 90%	9
51 - 75%	8
34 – 50%	7
26 – 33%	6
11 – 25%	5
4 – 10%	4
<4% with many individuals	3
<4% with several individuals	2
<4% with few individuals	1

Domin values are included in all tables.

Mires and heaths

M5 *Carex rostrata-Sphagnum squarrosum* mire

	Dom
Comarum palustre	7
Carex nigra	4
Eriophorum angustifolium	4
Succisa pratensis	5
Potentilla erecta	4
Anthoxanthum odoratum	3
Equisetum fluviatile	3
Festuca ovina agg.	3
Galium palustre	3
Menyanthes trifoliata	2-6
Sphagnum palustre	2-6
Aulacomnium palustre	2-4
Epilobium palustre	2-3
Hylocomium splendens	0-7
Rhytidiadelphus squarrosus	0-6
Carex rostrata	0-4
Ranunculus acris	0-4
Sphagnum subnitens	0-4
Viola palustris	0-4
Cardamine pratensis	0-3
Equisetum palustre	0-3
Silene flos-cuculi	0-3
Juncus articulatus	0-3
Festuca rubra	0-3
Cerastium fontanum	0-3
Holcus lanatus	0-2
Euphrasia arctica	0-2
Dactylorhiza purpurella	0-1
Carex echinata	0-1
Juncus bulbosus	0-1
Juncus effusus	0-1
Narthecium ossifragum	0-1
Rumex acetosa	0-1
Sphagnum teres	0-1
Triglochin palustris	0-1
Litter	0-4
Number of species per quadrat	20-27
Number of quadrats	2

M6 *Carex echinata-Sphagnum fallax/denticulatum* mire, M6b *Carex nigra-Nardus stricta* sub-community

	Freq	Dom
Sphagnum palustre	V	4-10
Succisa pratensis	V	3-8
Eriophorum angustifolium	V	3-6
Anthoxanthum odoratum	V	1-4
Equisetum palustre	V	2-5
Potentilla erecta	V	1-5
Agrostis cannina sens. lat	V	1-3
Festuca rubra	V	1-3
Hylocomium splendens	IV	4-7
Carex nigra	IV	4
Silene flos-cuculi	IV	1-4
Rhytidiadelphus squarrosus	III	3-5
Festuca ovina agg.	III	3
Molinia caerulea	III	2-5
Polytrichum commune	III	2-3
Aulacomnium palustre	III	1-4
Carex echinata	III	1-4
Dactylorhiza maculata	III	1-4
Holcus lanatus	III	1-3
Equisetum fluviatile	III	1-3
Luzula multiflora	III	1-3
Deschampsia flexuosa	II	5-7
Comarum palustre	II	4-6
Sphagnum fimbriatum	II	4
Galium saxatile	II	3-4
Poa humilis	II	3
Epilobium palustre	II	1-2
Cerastium fontanum	II	1
Empetrum nigrum nigrum	II	1
Rumex acetosa	II	1
Sphagnum denticulatum agg.	I	5
Straminergon stramineum	I	5
Dicranum scoparium	I	4
Cirsium palustre	I	3
Galium palustre	I	3
Prunella vulgaris	I	3
Trifolium repens	I	3
Carex pulicaris	I	2
Luzula sylvatica	I	2
Nardus stricta	I	2
Polytrichastrum formosum	I	2
Pedicularis palustris	I	1
Ranunculus acris	I	1
Litter	I	6
Number of species per quadrat		10-25
Number of quadrats		7

M6-M15 Carex *echinata-Sphagnum fallax/denticulatum – Trichophorum germanicum-Erica tetralix* wet heath transition

	Freq	Dom
Sphagnum palustre	V	6-10
Empetrum nigrum nigrum	V	5-9
Succisa pratensis	V	2-7
Equisetum fluviatile	V	1-4
Anthoxanthum odoratum	IV	1-3
Potentilla erecta	IV	1-3
Silene flos-cuculi	IV	1-2
Equisetum palustre	III	3
Carex nigra	III	2-4
Poa humilis	III	2
Comarum palustre	III	1-5
Eriophorum angustifolium	III	1-5
Festuca ovina agg.	III	1-3
Rumex acetosa	III	1-2
Deschampsia flexuosa	III	1-2
Aulacomnium palustre	II	2
Calluna vulgaris	II	1
Epilobium palustre	II	1
Holcus lanatus	II	2
Luzula multiflora	II	1
Polytrichum commune	II	1
Litter		
Number of species per quadrat		10-13
Number of quadrats		4

M23b *Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *J. effusus-J. acutiflorus* sub-community

	Dom
Juncus effusus	8
Anthoxanthum odoratum	5
Potentilla erecta	5
Carex nigra	4
Festuca rubra	4
Holcus lanatus	4
Eriophorum angustifolium	3
Ranunculus acris	3
Ranunculus flammula	2
Succisa pratensis	3
Silene flos-cuculi	2
Agrostis stolonifera	1
Carex leporina	1
Cirsium palustre	1
Deschampsia cespitosa	1
Epilobium palustre	1
Galium palustre	1
Litter	
Number of species per quadrat	17
Number of quadrats	1

M25 *Molinia caerulea-Potentilla erecta* mire, M25b Anthoxanthum odoratum sub-community

	Dom
Molinia caerulea	7
Deschampsia flexuosa	5
Empetrum nigrum nigrum	5
Sphagnum palustre	5
Carex nigra	4
Hylocomium splendens	4
Luzula sylvatica	4
Anthoxanthum odoratum	3
Festuca rubra	3
Festuca ovina agg.	3
Poa humilis	3
Comarum palustre	3
Galium saxatile	2
Potentilla erecta	2
Rumex acetosa	2
Eriophorum angustifolium	1
Number of species per quadrat	16
Number of quadrats	1

M25 *Molinia caerulea-Potentilla erecta* mire, M25c *Angelica sylvestris* sub-community

	Dom
Molinia caerulea	8
Rhytidiadelphus squarrosus	6
Carex echinata	5
Potentilla erecta	5
Carex nigra	4
Equisetum fluviatile	4
Equisetum palustre	4
Brachythecium rivulare	3
Cardamine pratensis	3
Eriophorum angustifolium	3
Silene flos-cuculi	3
Triglochin palustris	3
Anthoxanthum odoratum	2
Calliergonella cuspidata	2
Epilobium palustre	2
Succisa pratensis	2
Angelica sylvestris	1
Dactylorhiza maculata	1
Festuca ovina agg.	1
Festuca rubra	1
Hylocomium splendens	1
Plagiomnium undulatum	1
Ranunculus acris	1
Number of species per quadrat	23
Number of quadrats	1

M28 *Iris pseudacorus-Filipendula ulmaria* mire, M28a *Juncus* spp. sub-community

	Dom
Iris pseudacorus	9
Ranunculus acris	4-7
Rumex acetosa	4-5
Poa trivialis	3-6
Equisetum fluviatile	2-4
Caltha palustris	1-4
Angelica sylvestris	0-4
Cardamine pratensis	0-3
Dactylorhiza purpurella	0-3
Epilobium palustre	0-3
Phalaris arundinacea	0-3
Potentilla anserina	0-2
Agrostis stolonifera	0-1
Anthoxanthum odoratum	0-1
Festuca rubra	0-1
Rhinanthus minor	0-1
Rumex longifolius	0-1
Number of species per quadrat	7-13
Number of quadrats	2

M28 *Iris pseudacorus-Filipendula ulmaria* mire, non-NVC M28x species-poor sub-community

	Dom
Iris pseudacorus	10
Equisetum fluviatile	3
Caltha palustris	1
Comarum palustre	1
Ranunculus repens	1
Number of species per quadrat	5
Number of quadrats	1

MG5 *Cynosurus cristatus-Centaurea nigra* grassland, MG5c *Danthonia decumbens* sub-community

	Freq	Dom
Carex nigra	V	5-8
Succisa pratensis	V	4-6
Anthoxanthum odoratum	V	3-5
Trifolium repens	V	3-5
Holcus lanatus	V	3-4
Festuca rubra	V	2-5
Agrostis capillaris	V	1-4
Silene flos-cuculi	V	1-4
Cynosurus cristatus	IV	2-5
Scorzoneroides autumnalis	IV	1-3
Rhinanthus minor	IV	1-2
Ranunculus acris	III	3-5
Carex echinata	III	3-4
Agrostis stolonifera	III	3-4
Luzula multiflora	III	2-3
Plantago lanceolata	III	1-4
Dactylorhiza maculata	III	1-2
Deschampsia cespitosa	III	1-2
Plagiomnium undulatum	II	4-5
Equisetum palustre	II	3-6
Rhytidiadelphus squarrosus	II	3-4
Hypochaeris radicata	II	3
Kindbergia praelonga	II	2-3
Trifolium pratense	II	1-5
Potentilla erecta	II	1-4
Cerastium fontanum	II	1-2
Agrostis canina sens. Lat.	II	1
Lotus corniculatus	I	4
Prunella vulgaris	I	4
Potentilla anserina	I	4
Pseudoscleropodium purum	I	4
Aira praecox	I	2
Nardus stricta	I	2
Polytrichastrum formosum	I	2
Vicia cracca	I	2
Calliergonella cuspidata	I	1
Conopodium majus	I	1
Poa humilis	I	1
Poa trivialis	I	1
Angelica sylvestris	I	1
Equisetum fluviatile	I	1
Number of species per quadrat		16-28
Number of quadrats		5

MG6 *Lolium perenne-Cynosurus cristatus* grassland, MG6b *Anthoxanthum odoratum* sub-community

	Dom
Lolium perenne	6
Conopodium majus	6
Phleum pratense	5
Trifolium repens	5
Anthoxanthum odoratum	4
Cynosurus cristatus	4
Holcus lanatus	4
Plantago lanceolata	4
Agrostis capillaris	3
Dactylis glomerata	3
Festuca rubra	3
Poa trivialis	3
Rumex acetosa	3
Trifolium pratense	3
Rhinanthus minor	2
Vicia sepium	2
Bellis perennis	1
Heracleum sphondylium	1
Poa humilis	1
Ranunculus acris	1
Number of species per quadrat	19
Number of quadrats	1

MG8 *Cynosurus cristatus-Caltha palustris* grassland

	Freq	Dom			
Carex nigra	V	4-8			
Caltha palustris	V	3-8			
Anthoxanthum odoratum	V	3-4			
Silene flos-cuculi	V	3-4			
Equisetum palustre	V	2-5			
Cardamine pratensis	V	2-4			
Festuca rubra	V	1-5			
Holcus lanatus	V	1-4			
Succisa pratensis	IV	4			
Rhytidiadelphus squarrosus	IV	3-8			
Eriophorum angustifolium	IV	3-4			
Carex echinata	IV	2-4			
Epilobium palustre	IV	2-3			
Galium palustre	IV	1-5			
Trifolium repens	IV	1-5			
Agrostis stolonifera	IV	1-4			
Ranunculus acris	IV	1-4			
Potentilla erecta	IV	1-3			
Ranunculus flammula	III	2-4			
Calliergonella cuspidata	III	1-7			
Cerastium fontanum	III	1-3			
Luzula multiflora	III	1-3			
Poa pratensis agg.	II	3-4			
Myosotis secunda	II	2-3			
Angelica sylvestris	II	1-5			
Cynosurus cristatus	II	1-4			
Dactylorhiza maculata	II	1-3			
Comarum palustre	II	1-2			
Hylocomium splendens	I	4			
Juncus articulatus	I	4			
Rumex acetosa	I	4			
Brachythecium rivulare	I	3			
Dactylorhiza purpurella	I	3			
Menyanthes trifoliata	I	3			
Potentilla anserina	I	3			
Kindbergia praelonga	I	2-5			
Brachythecium rutabulum	I	2	*Deschampsia cespitosa*	I	1
Calypogeia fissa	I	2	*Euphrasia arctica*	I	1
Lophocolea bidentata	I	2	*Iris pseudacorus*	I	1
Montia fontana	I	2	*Juncus bulbosus*	I	1
Trifolium pratense	I	2	*Polytrichastrum formosum*	I	1
Triglochin palustris	I	2	*Rhinanthus minor*	I	1
Carex panicea	I	1-5	*Senecio aquaticus*	I	1
Equisetum fluviatile	I	1-4	*Danthonia decumbens*	I	1
Molinia caerulea	I	1-2	*Sphagnum denticulatum*	I	1
Plagiomnium undulatum	I	1-2	*Stellaria alsine*	I	1
Aira praecox	I	1	*Persicaria amphibia*	I	1
Agrostis capillaris	I	1			
Aulacomium palustre	I	1	Litter	II	5-7
Bellis perennis	I	1			
Bryum pseudotriquetrum	I	1	Number of species per quadrat		15-34
Dactylorhiza x formosa	I	1	Number of quadrats		10

***MGcn* provisional *Carex nigra* grassland/fen community**

	Freq	Dom
Carex nigra	V	4-8
Anthoxanthum odoratum	V	3-4
Festuca rubra	V	1-5
Potentilla erecta	V	1-5
Holcus lanatus	V	1-4
Silene flos-cuculi	V	1-4
Rhytidiadelphus squarrosus	IV	3-7
Equisetum palustre	IV	1-7
Succisa pratensis	IV	1-7
Equisetum fluviatile	IV	1-4
Ranunculus acris	IV	1-4
Cardamine pratensis	IV	1-3
Angelica sylvestris	III	1-6
Poa humilis	III	2-4
Eriophorum angustifolium	III	1-6
Comarum palustre	III	1-5
Molinia caerulea	III	1-4
Agrostis canina sens. lat.	III	1-4
Agrostis capillaris	III	1-3
Rumex acetosa	III	1-3
Caltha palustris	III	1
Trifolium repens	II	2-7
Carex echinata	II	2-3
Agrostis stolonifera	II	2-4
Aulacomnium palustre	II	1-4
Epilobium palustre	II	1-3
Luzula multiflora	II	1-3
Festuca ovina agg.	II	1-3
Carex panicea	II	1-2
Hylocomium splendens	I	4-7
Iris pseudacorus	I	4
Pellia sp.	I	4
Scorzoneroides autumnalis	I	4
Sphagnum palustre	I	4
Ficaria verna fertilis	I	3-4
Kindbergia praelonga	I	3-4
Calliergonella cuspidata	I	3
Plagiomnium undulatum	I	3
Poa trivialis	I	3
Senecio aquaticus	I	3
Dactylorhiza maculata	I	2-4
Cerastium fontanum	I	2-3
Viola palustris	I	1-4
Cirsium palustre	I	1-3
Galium palustre	I	1-3
Dactylorhiza purpurella	I	1-2
Aira praecox	I	2
Potentilla anserina	I	2
Scapania irrigua	I	2
Straminergon stramineum	I	2
Deschampsia cespitosa	I	1

Nardus stricta	I	1
Rhinanthus minor	I	1
Sphagnum inundatum	I	1
Litter	IV	5-9
Number of species per quadrat		13-27
Number of quadrats		12

***MG9 Holcus lanatus-Deschampsia cespitosa* grassland, MG9a *Poa trivialis* sub-community**

	Dom
Deschampsia cespitosa	8
Festuca rubra	5
Agrostis capillaris	3
Potentilla erecta	3
Poa humilis	3
Anthoxanthum odoratum	2
Succisa pratensis	2
Equisetum fluviatile	2
Carex nigra	1
Equisetum palustre	1
Litter	7
Number of species per quadrat	10
Number of quadrats	1

U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, U4d *Luzula multiflora-Rhytidiadelphus loreus* sub-community

	Freq	Dom
Anthoxanthum odoratum	V	4-7
Potentilla erecta	V	3-5
Hylocomium splendens	V	2-10
Carex nigra	V	1-7
Festuca ovina agg.	V	1-4
Succisa pratensis	IV	4-8
Galium saxatile	IV	1-4
Agrostis canina sens lat.	IV	1-2
Molinia caerulea	III	4-5
Deschampsia cespitosa	III	3-7
Scilla verna	III	2-3
Carex echinata	III	1-4
Deschampsia flexuosa	II	4-8
Trifolium repens	II	3-5
Eriophorum angustifolium	II	3-4
Poa humilis	II	2-6
Dactylorhiza maculata	II	2-4
Cerastium fontanum	II	2-3
Hypochaeris radicata	II	1-7
Holcus lanatus	II	1-4
Rumex acetosa	II	1-4
Festuca rubra	II	1-3
Luzula multiflora	II	1-3
Agrostis capillaris	II	1-3
Jasione montana	II	1-2
Sphagnum palustre	I	5
Rhytidiadelphus squarrosus	I	4-6
Peltigera sp.	I	4
Ranunculus acris	I	4
Rhinanthus minor	I	4
Equisetum palustre	I	3-4
Polytrichastrum formosum	I	3-4
Poa trivialis	I	3
Silene flos-cuculi	I	2-3
Carex panicea	I	2
Equisetum fluviatile	I	1-4
Nardus stricta	I	1-3
Luzula sylvatica	I	1-2
Danthonia decumbens	I	1
Juncus squarrosus	I	1
Conopodium majus	I	1
Angelica sylvestris	I	1
Cynosurus cristatus	I	1
Cirsium palustre	I	1
Dactylorhiza x formosa	I	1
Dicranum scoparium	I	1
Empetrum nigrum nigrum	I	1
Epilobium palustre	I	1
Galium palustre	I	1
Viola palustris	I	1
Trifolium pratense	I	1

Litter	II	4-5
Number of species per quadrat		12-30
Number of quadrats		10

Swamps and tall-herb fens

S10 *Equisetum fluviatile* swamp, S10b *Carex rostrata* sub-community

	Dom
Menyanthes trifoliata	10
Comarum palustre	4
Equisetum fluviatile	4
Poa trivialis	1
Number of species per quadrat	4
Number of quadrats	1

S27 Carex rostrata-Comarum palustre* tall-herb fen, *S27b Lysimachia vulgaris sub-community

	Freq	Dom
Comarum palustre	V	4-9
Carex nigra	V	3-8
Equisetum fluviatile	V	2-4
Menyanthes trifoliata	V	1-9
Eriophorum angustifolium	IV	1-5
Galium palustre	IV	1-4
Holcus lanatus	IV	1-4
Anthoxanthum odoratum	IV	1-3
Equisetum palustre	III	2-4
Silene flos-cuculi	III	2-3
Juncus articulatus	III	1-5
Agrostis stolonifera	III	1-3
Salix repens	II	4
Succisa pratensis	II	3-5
Caltha palustris	II	3-4
Festuca rubra	II	2-3
Carex rostrata	II	1-8
Angelica sylvestris	II	1-4
Poa humilis	II	1-4
Ranunculus flammula	II	1-4
Epilobium palustre	II	1-3
Potentilla erecta	II	1-3
Cardamine pratensis	II	1-2
Agrostis canina sens. lat.	II	1-2
Ranunculus acris	II	1-2
Calliergon cordifolium	II	1
Viccia cracca	II	1
Rhytidiadelphus squarrosus	I	4
Agrostis capillaris	I	3
Carex echinata	I	3
Persicaria amphibia	I	3
Poa trivialis	I	3
Trifolium repens	I	3
Dactylorhiza purpurella	I	2
Lophocolea bidentata	I	2
Molinia caerulea	I	2
Carex panicea	I	1
Cerastium fontanum	I	1
Euphrasia arctica	I	1
Juncus effusus	I	1
Luzula multiflora	I	1
Rhinanthus minor	I	1
Pellia sp.	I	1
Number of species per quadrat		9-21
Number of quadrats		9

***S27 Carex rostrata-Comarum palustre* tall-herb fen, S27bi 'Mixed fen' variant**

	Freq	Dom
Equisetum fluviatile	V	4-6
Caltha palustris	V	1-8
Eleocharis palustris	V	1-7
Carex nigra	V	1-6
Persicaria amphibia	IV	4-6
Poa trivialis	IV	1-7
Holcus lanatus	IV	1-5
Agrostis stolonifera	IV	1-4
Anthoxanthum odoratum	IV	2-3
Epilobium palustre	IV	1-3
Comarum palustre	III	4-7
Ranunculus acris	III	1-4
Galium palustre	III	2-4
Rumex acetosa	III	2-3
Festuca rubra	III	1-3
Angelica sylvestris	II	5
Menyanthes trifoliata	II	4
Juncus articulatus	II	3
Equisetum palustre	II	2
Trifolium repens	II	2
Ranunculus flammula	II	2
Dactylorhiza purpurella	II	1
Deschampsia cespitosa	II	1
Glyceria fluitans	II	1
Cardamine pratensis	II	1
Calliergon cordifolium	II	1
Iris pseudacorus	II	1
Silene flos-cuculi		
Number of species per quadrat		7-17
Number of quadrats		4

Maritime communities

SM16 *Festuca rubra* salt-marsh, SM16b sub-community with *Juncus gerardii* dominant

	Freq	Dom
Juncus gerardii	V	7-9
Agrostis stolonifera	V	4-5
Festuca rubra	V	3-5
Triglochin maritima	V	2-7
Trifolium repens	IV	4
Rumex acetosa	IV	3-4
Angelica sylvestris	IV	1-4
Armeria maritima	II	5
Holcus lanatus	II	4
Carex nigra	II	4
Poa humilis	II	4
Triglochin palustris	II	4
Glaux maritima	II	3
Plantago maritima	II	3
Senecio aquaticus	II	1
Number of species per quadrat		7-11
Number of quadrats		3

SM28 *Elytrigia repens* salt-marsh community

	Dom
Elytrigia repens	9
Festuca rubra	5
Agrostis stolonifera	3
Agrostis capillaris	2
Poa humilis	2
Potentilla anserina	2
Angelica sylvestris	1
Atriplex prostrata agg.	1
Plantago lanceolata	1
Plantago maritima	1
Rumex acetosa	1
Triglochin maritima	1
Trifolium repens	1
Number of species per quadrat	13
Number of quadrats	1

ANNEX 3: VASCULAR PLANTS RECORDED

Achillea millefolium	Yarrow	Rare
Agrostis capillaris	Common Bent	Frequent
Agrostis stolonifera	Creeping Bent	Frequent
Agrostis vinealis	Brown Bent	Frequent
Aira praecox	Early Hair-grass	Occasional
Alopecurus geniculatus	Marsh Foxtail	Rare
Alopecurus pratensis	Meadow Foxtail	Rare
Angelica sylvestris	Wild Angelica	Frequent
Anthoxanthum odoratum	Sweet Vernal-grass	Abundant
Armeria maritima	Thrift, Sea-pink	Local (by sea)
Arrhenatherum elatius	False Oat-grass	Rare
Atriplex glabriuscula	Babington's Orache	Local (sea shore)
Bellis perennis	Daisy	Rare
Callitriche stagnalis	Common Water-starwort	Occasional
Calluna vulgaris	Heather	Rare
Caltha palustris	Marsh-marigold	Abundant
Cardamine flexuosa	Wavy Bitter-cress	Rare
Cardamine pratensis	Cuckooflower	Frequent
Carex echinata	Star Sedge	Frequent
Carex nigra	Common Sedge	Abundant
Carex panicea	Carnation Sedge	Occasional
Carex pulicaris	Flea Sedge	Rare
Carex rostrata	Bottle Sedge	Occasional
Cerastium fontanum subsp. vulgare	Common Mouse-ear	Frequent
Cirsium palustre	Marsh Thistle	Occasional
Cochlearia officinalis	Common Scurvy-grass	Local (by sea)
Comarum palustre	Marsh Cinquefoil	Abundant
Conopodium majus	Pig-nut	Occasional
Cynosurus cristatus	Crested Dog's-tail	Occasional
Dactylis glomerata	Cock's-foot	Rare
Dactylorhiza maculata subsp. ericetorum	Heath Spotted-orchid	Frequent
Dactylorhiza purpurella	Northern Marsh-orchid	Occasional
Dactylorhiza x formosa	D. maculata x purpurella	Rare
Danthonia decumbens	Heath-grass	Rare
Deschampsia cespitosa subsp. cespitosa	Tufted Hair-grass	Occasional
Deschampsia flexuosa	Wavy Hair-grass	Frequent
Eleocharis palustris	Common Spike-rush	Occasional
Elytrigia repens	Common Couch	Rare
Empetrum nigrum subsp. nigrum	Crowberry	Occasional
Epilobium ciliatum	American Willowherb	Rare
Epilobium palustre	Marsh Willowherb	Frequent
Equisetum fluviatile	Water Horsetail	Frequent
Equisetum palustre	Marsh Horsetail	Abundant
Eriophorum angustifolium	Common Cottongrass	Abundant
Eriophorum vaginatum	Hair's-tail Cottongrass	Rare

Euphrasia arctica	Eyebright	Rare
Festuca rubra	Red Fescue	Abundant
Festuca vivipara	Viviparous Sheep's-fescue	Frequent
Galium palustre subsp. palustre	Marsh Bedstraw	Frequent
Galium saxatile	Heath Bedstraw	Occasional
Glaux maritima	Sea Milkwort	Local (sea shore)
Glyceria fluitans	Floating Sweet-grass	Rare
Heracleum sphondylium	Hogweed	Rare
Holcus lanatus	Yorkshire-fog	Abundant
Holcus mollis	Creeping Soft-grass	Rare
Hydrocotyle vulgaris	Marsh Pennywort	Rare
Hypochaeris radicata	Cat's-ear	Occasional
Iris pseudacorus	Yellow Iris	Occasional
Jasione montana	Sheep’s-bit	Rare
Juncus articulatus	Jointed Rush	Occasional
Juncus bufonius	Toad Rush	Rare
Juncus bulbosus	Bulbous Rush	Occasional
Juncus effusus	Soft-rush	Occasional
Juncus gerardii	Saltmarsh Rush	Local (by sea)
Juncus squarrosus	Heath Rush	Rare
Lemna minor	Common Duckweed	Rare
Lolium perenne	Ryegrass	Rare
Lotus corniculatus	Common Bird's-foot-trefoil	Rare
Luzula multiflora	Heath Wood-rush	Frequent
Luzula sylvatica	Great Woodrush	Rare
Menyanthes trifoliata	Bogbean	Frequent
Mimulus guttatus x M. luteus	Hybrid Monkeyflower	Rare
Molinia caerulea	Purple Moor-grass	Occasional
Montia fontana	Blinks	Rare
Myosotis discolour	Changing Forget-me-not	Rare
Myosotis laxa	Tufted Forget-me-not	Rare
Myosotis scorpioides	Water Forget-me-not	Rare
Myosotis secunda	Creeping Forget-me-not	Frequent
Nardus stricta	Mat-grass	Occasional
Narthecium ossifragum	Bog Asphodel	Rare
Nasturtium officinale	Water-cress	Rare
Pedicularis palustris	Marsh Lousewort	Occasional
Persicaria amphibia	Amphibious Bistort	Rare
Phalaris arundinacea	Reed Canary-grass	Rare
Plantago lanceolata	Ribwort Plantain	Occasional
Plantago maritima	Sea Plantain	Local (by sea)
Poa annua	Annual Meadow-grass	Rare
Poa humilis	Spreading Meadow-grass	Frequent
Poa trivialis	Rough Meadow-grass	Frequent
Potamogeton polygonifolius	Bog Pondweed	Rare
Potentilla anserina	Silverweed	Rare
Potentilla erecta	Tormentil	Abundant
Prunella vulgaris	Selfheal	Rare

Pucinellia maritima	Common Saltmarsh-grass	Local (sea shore)
Ranunculus acris	Meadow Buttercup	Abundant
Ranunculus ficaria	Lesser Celandine	Rare
Ranunculus flammula	Lesser Spearwort	Occasional
Ranunculus hederaceus	Ivy-leaved Water-crowfoor	Rare
Ranunculus repens	Creeping Buttercup	Rare
Rhinanthus minor subsp. stenophyllus	Yellow-rattle	Occasional
Rosa rugosa	Japanese Rose	Rare
Rumex acetosa	Common Sorrel	Frequent
Rumex crispus ssp. crispus	Curled Dock	Rare
Rumex longifolius	Northern Dock	Rare
Rumex obtusifolius	Broad-leaved Dock	Rare
Sagina maritima	Sea Pearlwort	Local (sea shore)
Sagina procumbens	Procumbent Pearlwort	Rare
Salix repens	Creeping Willow	Occasional
Salix x holosericea (S. viminalis x S. cinerea)	Silky-leaved Willow	Rare
Scilla verna	Spring Squill	Rare
Scorzoneroides autumnalis	Autumn Hawkbit	Occasional
Senecio aquaticus	Marsh Ragwort	Occasional
Silene dioica	Red Campion	Rare
Silene flos-cuculi	Ragged-Robin	Abundant
Stellaria alsine	Bog Stitchwort	Occasional
Succisa pratensis	Devil's-bit Scabious	Abundant
Taraxacum agg.	Dandelion	Rare
Trifolium pratense	Red Clover	Occasional
Trifolium repens	White Clover	Frequent
Triglochin maritimum	Sea Arrowgrass	Local (by sea)
Triglochin palustre	Marsh Arrowgrass	Rare
Vicia cracca	Tufted Vetch	Rare
Viola palustris	Marsh Violet	Frequent

TOTAL 123

ANNEX 4: TARGET NOTES

Target note no.	National grid ref	Parcel no.	Description	Photo no.
TN01	HU4370929257	52	*Salix repens* abundant in M6-M15 mire-heath transition	PT81
TN02	HU4388929391	40	Ditch eutrophication - *Mimulus guttatus x M. luteus*	PT82
TN03	HU4388929391	40	Ditch eutophication - *Rumex obtusifolius* and *Iris pseudacorus*	PT83
TN04	HU4389529361	39	*Jasione montana* in U4d grassland	PT84
TN05	HU4416529649	11	Side-ditch with *Carex rostrata*	PT85
TN06	HU4421829557	14E	Non-native willows *Salix x holosericea* (*S. viminalis x S. cinerea*), planted.	None
TN07	HU4422029461	18E	*Calluna vulgaris* in M6-M15 mire-heath transition	PT87
TN08	HU44262954	15E	Strip of planted bushes along road side - *Acer pseudoplatanus* and *Salix* x *holosericea* (*S. viminalis* x *S. cinerea*)	None

ANNEX 5: LIST OF ADDITIONAL ELECTRONIC FILES

1. Spreadsheet containing full quadrat data - **Aith quadrat data 2016.xlsx**

2. Spreadsheet referencing quadrat data, target notes and linked images (**Aith Quadrats TNs & photos ref 2016.xlsx)**

3. Scan of NVC annotated map (**Aith NVC map.pdf**)

4. Scan of EUNIS and Annex 1 annotated map (**Aith EUNIS & Annex 1 map.pdf)**

4. Scan of map annotated with quadrat and target note positions (**Aith quadrat & target notes.pdf**)

5. All images linked to quadrats and target notes, plus those used to illustrate report (**Aith images 2016 (folder)**

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