Bridlington to Reighton Sands, North and East Yorkshire National Vegetation Classification Survey Report 2021

National Vegetation Classification (NVC) by Haycock and Jay Associated Ltd

August 2024

Natural England Commissioned Report NECR567

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Catalogue code: NECR567

Report details

Author(s)

Haycock & Jay Associates Ltd Consultant Ecologists

Natural England Project Manager

Peter Norris

Contractor

Haycock and Jay Associates Ltd – Consultant Ecologists

10 Boroughgate, Otley, West Yorkshire, LS21 3AL

Keywords

Maritime Cliff and Slope, NVC, National Vegetation Classification, Flamborough, Filey Brigg

Citation

Haycock & Jay Associates. 2024. Bridlington to Reighton Sands NVC Survey 2021 Report. NECR567. Natural England.

Foreword

An NVC survey of maritime cliff and slope vegetation habitats between Bridlington and Reighton Sands on the east coast of Yorkshire was undertaken in 2021 to investigate the potential for their inclusion within a Site of Special Scientific Interest (SSSI). This report does not itself make a case for designation, rather it provides an objective record of the survey findings which will be used to support Natural England's independent assessment of special interest.

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Executive summary

Haycock and Jay Associates were commissioned by Natural England to undertake a National Vegetation Classification (NVC) survey of habitats within a survey area extending from Reighton Gap to Sewerby encompassing Flamborough Head. The survey identified a complex interplay of factors which were found to be influencing grassland and maritime vegetation communities. These include soils and underlying geology, aspect, slope, amount of input from salt-spray, drainage and locally on hard-cliffs, enrichment by sea birds. Vegetation occurring on perched soft cliff over chalk at Thornwick Bay demonstrates the subtle interplay of calcareous substrate, soft cliff erosion characteristics and maritime influence.

Flamborough Head protrudes into the North Sea presenting two aspects: a north-facing aspect from Reighton Sands to Flamborough Head lighthouse, and a south-facing aspect from the lighthouse to Sewerby.

The northern aspect consists of soft cliff at Reighton rising to high chalk cliffs at Bempton and then descending to low chalk cliffs supporting perched soft cliff in the inlets around the headland (Thornwick Bay, North Landing and Selwick Bay). Maritime influence is relatively high on this northern side exposed to regular northerly gales and perched saltmarsh is present on Flamborough Head along with well-developed maritime grassland. The occurrence of a large seabird colony also influences the flora and eutrophication is apparent in this area. Whilst salt deposition on top of the high cliffs is low, the combination of extreme exposure to maritime wind and eutrophication has created some unique communities on Yorkshire's east coast.

The dynamic nature of the soft cliffs above Speeton Sands has led to creation of a complex of vegetation with natural processes causing slipping and erosion at varying rates in different parts of the site. Extensive areas of bare ground and rotational slippage to form wetlands occurs alongside stabilised species-rich calcareous grassland and wind-clipped thickets of scrub.

The southern aspect of the headland is more uniform with low chalk cliffs supporting perched soft cliff which is variously flushed. Maritime influence is low, and the maritime grassland present is analogous to that encountered on England's south coast. Whilst not the focus of this survey, it is considered likely that these sheltered south, and south-east facing slopes could be important for a range of thermophilous invertebrates characteristic of soft cliffs.

Sub-maritime grassland was also recorded along much of the coast; these are essentially lowland grasslands occurring on maritime cliff and consequently supporting an unusual assemblage of species including some species limited to coastal sites. Sub-maritime and para-maritime features, in particular dense scrub and woodland were also recorded. In these cases the influence of the sea is not immediately apparent, however, the sculpting of

these features by constant strong winds from the sea is clear, and some climatic maritime influence is apparent. Woodland is restricted to gills at Speeton Sands, South Landing and Dane’s Dyke Country Park.

Contents

Introduction

Background

Haycock and Jay Associates were commissioned by Natural England to undertake a National Vegetation Classification (NVC) survey of habitats within a survey area extending from Reighton Gap to Sewerby including Flamborough Head.

This report presents data collected during August and September 2021 and represents an update for survey carried out in this area by Milliken and Pendry in 2002.

For each community a description is recorded followed by a species list for that community, and quadrat data gathered during the survey where appropriate. The extent of each vegetation community is mapped on Figure 1 and tabulated below.

Where communities were encountered in intimate mosaic, these areas have been recorded on Figure 1 as 'Mosaic' along with a label indicating which communities are present. Each mosaic is also labelled with a letter. The percentage of each community in each labelled mosaic area is recorded in Section 3.43 below.

It should be noted that where vegetation occurs on steep or vertical substrates then the mapped area will under-estimate the extent of the community. This is particularly pertinent for cliff ledge vegetation and maritime grassland occurring on steep slopes at the cliff top (e.g. MC8 and MC6).

Table 1 – NVC communities found within the survey area.

NVC Community	Extend (ha)
CG2c *Festuca ovina – Helictotrichon pratense* grassland; *Holcus lanatus –Trifolium repens* sub-community	4.46
CG2c* *Festuca ovina – Helictotrichon pratense* grassland; *Holcus lanatus –* ***Trifolium repens* sub-community variant**	0.08
AR *Arrhenatherum* / *Teucrium* Scree Slope Vegetation**	7.46
M10 *Carex dioica – Pinguicula vulgaris* mire	0.33

NVC Community	Extend (ha)
M27b *Filipendula ulmaria* – *Angelica sylvestris* mire; *Urtica dioica* – *Vicia cracca* sub-community	0.24
M38 *Palustriella commutata* – *Carex nigra* spring	0.03
MC6 *Atriplex prostrata* – *Beta vulgaris* ssp. *maritima* sea-bird cliff community	0.25
MC8a *Festuca rubra* – *Armeria maritima* grassland; Typical sub-community	10.39
MC8f *Festuca rubra* – *Armeria maritima* grassland; *Anthyllis vulneraria* sub-community	3.93
MC9b *Festuca rubra* – *Holcus lanatus* maritime grassland; *Dactylis glomerata* sub-community	14.40
MC9e *Festuca rubra* – *Holcus lanatus* maritime grassland; *Anthoxanthum* *odoratum* sub-community	0.17
MC10a *Festuca rubra* – *Plantago* spp. maritime grassland *Armeria maritima* sub-community	0.80
MC11b *Festuca rubra* – *Daucus carota* ssp *gummifer* maritime grassland *Sanguisorba minor* sub-community	5.33
MG1a *Arrhenatherum elatius* grassland; *Festuca rubra* sub-community	52.33
MG5b *Cynosurus cristatus* – *Centaurea nigra* grassland *Galium verum* sub community	2.22
MG6a *Lolium perenne-Cynosurus cristatus* grassland; Typical sub community	25.47

NVC Community	Extend (ha)
MG7 *Lolium perenne* leys	2.40
MG9b *Holcus lanatus* – *Deschampsia cespitosa* grassland *Arrhenatherum elatius* sub-community	0.46
MG10a *Holcus lanatus* – *Juncus effusus* rush-pasture Typical sub-community	1.46
MG11b *Festuca rubra* – *Agrostis stolonifera* – *Potentilla anserina* grassland, *Atriplex prostrata* sub-community	11.59
MG12a – *Festuca arundinacea* grassland *Lolium perenne* – *Holcus lanatus* sub-community	2.85
S4b *Phragmites australis* reedbed *Galium palustre* sub-community	10.88
S4diii *Phragmites australis* reedbed *Atriplex prostrata* sub-community *Agrostis stolonifera* variant	0.07
SD2 *Honkenya peploides* – *Cakile maritima* strandline community	>0.01
SD5 *Leymus arenarius* mobile dune community	>0.01
S12b *Typha latifolia* swamp *Mentha aquatica* sub-community	>0.01
S14 *Sparganium erectum* swamp	>0.01
S19 *Eleocharis palustris* swamp	0.07
SM16 *Festuca rubra* saltmarsh	0.02
SM28 *Elymus repens* salt-marsh community	>0.01
OV25 *Urtica dioica* – *Cirsium arvense* community	0.27
OV26 *Epilobium hirsutum* community	2.31

NVC Community	Extend (ha)
OV27 *Chamerion angustifolium* community	0.14
U4a *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland Typical sub-community	1.30
W1 *Salix cinerea – Galium palustre* woodland	0.22
W8 *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland	10.50
W21 *Crataegus monogyna – Hedera helix* scrub	1.24
W22c *Prunus spinosa – Rubus fruticosus* agg. scrub; *Dactylis glomerata* sub-community	7.68
W23 *Ulex europaeus – Rubus fruticosus* scrub	4.09
W24 *Rubus fruticosus – Holcus lanatus* underscrub	5.26
W25 *Pteridium aquilinum – Rubus fruticosus* underscrub	0.20

Methodology

National Vegetation Classification Survey

The method used for this survey followed the approach for National Vegetation Classification (NVC) survey as described by Rodwell *et al* (1992) and Rodwell (2006). This allows the vegetation communities identified to be classified in accordance with the accounts published in British Plant Communities (Rodwell *et al*, 1991 *et seq*.).

In accordance with Rodwell (2006), survey was undertaken across the site to determine variation in vegetation and delimit homogenous stands. Where there was a readily observable boundary between homogenous stands this was mapped accordingly, however, where there was a diffuse boundary between vegetation types this was mapped at a mid-point in the transition from one vegetation type to another. Taking into account the width of a line representing a vegetation boundary on the map as it would appear on the ground, this was rarely necessary. Genuine mosaics of different NVC sub-communities were mapped as single polygons and a note taken of the percentage of each sub-community recorded in the polygon.

For each homogenous stand of vegetation identified, five or more vegetation samples were taken by laying out a 2 x 2m quadrat to record the abundance and frequency of all species of flora present. Where the sward was short and species densely packed, a 1m x 1m quadrat was used. The number of quadrats taken for each homogenous stand was dependent on the extent of the stand, and the variation within it. Small stands of homogenous vegetation had fewer quadrat samples than large stands where the flora was more variable. In addition, the proportion of bare ground, vegetation height in centimetres and a photograph of each quadrat was recorded.

Within each quadrat/sample, all species of vascular plant and bryophytes (mosses and liverworts) were identified and, for each species, the percentage cover of the quadrat was estimated. In addition, a full species list for each community was made including species not featuring in the quadrats, and an indication of abundance throughout the community recorded using the DAFOR scale. Each species was classified as either Dominant, Abundant, Frequent, Occasional or Rare for the community.

Table 2 – The figure for percentage cover for each species in each quadrat was recorded as a Domin value. Domin values are as follows:

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

Following field survey and for the purposes of assigning a community in the NVC, the frequency of each species in each homogenous stand was calculated here:

I = 1-20% of quadrats

II = 21-40%

III = 41-60%

IV = 61-80%

V = 81-100%

Finally, the NVC community type was determined by comparing the results of the field survey, using both keys and the experience of the field surveyor, with the published accounts and floristic tables given in British Plant Communities (Rodwell et al., 1991 et seq.).

It is widely acknowledged that applying software to NVC datasets does not provide a more ‘robust’ assessment of results and placement of vegetation within the NVC. The various software applications available rely on data input and interpretation of the output, both of which are based on professional judgement (placement of quadrats and then interpretation of results). Experience of applying MAVIS and other software indicates that it is imperative that the practitioner knows what the sub-community is prior to using the software in order to interpret the results correctly. There appears little to be gained from running data through a software programme unless the purpose is simply to convince the reader with what is regarded as ‘empirical evidence’ (which it clearly is not). Consequently, it was not considered necessary to use computer software to assist in assigning NVC community in this study.

The community description provides a discussion of how the floristic features compare to the standard vegetation community descriptions and highlights the character of vegetation communities at this site.

Constraints

The NVC survey was undertaken in good weather conditions during the latter part of the optimal time of year. As such early flowering species and annuals were less apparent, and it was not possible to identify some plants to species level. In particular orchids have often been recorded simply as *Dactylorhiza* sp.

Some vegetation communities were not safely accessible due to their proximity to the edge of the cliff or occurrence on steep, unstable substrate. These communities could not be surveyed directly, but with use of binoculars it was possible to attribute them to a sub-community without quadrat survey.

National Vegetation Classification survey results

Introduction

An NVC survey of habitats within the survey boundary from Reighton Sands south to Bridlington was undertaken between 23rd August and 22nd September 2021 by Principal Ecologist Gordon Haycock CEcol CEnv FCIEEM.

NVC communities are mapped on Figure 1, and a photograph of each quadrat is attached at Appendix 1.

Appendix 2 is an Excel spreadsheet summarising results and tabulating each NVC sub-community including NVC community, broad habitat, Priority Habitat (where relevant) and maritime status.

Appendix 3 is a Figure taken from our previous report, and an updated table showing NVC sub-communities present in each morphological section. Reporting on protection works was outside the scope of the current study.

Community Descriptions

Rationale

The National Vegetation Classification (NVC) sets out to represent identifiable communities at various points in the phyto-sociological continuum. In the introduction to Maritime Cliff Communities (Rodwell 2000), it is stated that the east coast of England, and in particular soft cliffs, were not extensively sampled, and this vegetation is not comprehensively characterised at present. Indeed, sampling from the North Yorkshire coast barely appears to have taken place at all. Consequently vegetation communities encountered do not always readily accord with those described in Rodwell.

In describing the vegetation, the terms Maritime, Sub-maritime and Para-maritime (as defined by Ratcliffe 1977) have been used. Maritime communities show strong and direct influence of sea with markedly saline soils. Sub-maritime vegetation shows less direct effect of sea, however, soils are still more saline than those inland. Para-maritime communities occur in the zone in which special climatic conditions of sea coast are influential but soils are not saline and halophytes not present. All three types of vegetation

should be regarded as elements of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts.

Vegetation communities encountered during the survey are described in terms of analogous communities appearing in the NVC published literature and their 'maritime status' stated. These are the headings and labels given to the community, but practitioners must remain aware that whilst those NVC codes have been assigned, the communities we are dealing with differ in significant ways from those described in Rodwell. This is particularly important when considering the mapped information.

In addition to published NVC communities, Milliken and Pendry (2002) suggested further communities not currently described in NVC. Of these, one community has been adopted in this study as being clearly defined and with no suitable analogue in published NVC; this community is AR** *Arrhenatherum – Teucrium* scree slope vegetation.

Community descriptions are offered below for each sub-community encountered based on quadrat data collected.

Community; CG2c *Festuca ovina – Helictotrichloa pratensis* grassland; *Holcus lanatus – Trifolium repens* sub-community

Table 3 – CG2c Community Attributes.

Attribute	NVC code – CG2c
Broad habitat type	Calcareous Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Calcareous Grassland
UKHabs code	g2a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

Whilst neither sheep's fescue nor meadow oat-grass were recorded during the survey, other community constants are well represented including glaucous sedge, mouse-ear hawkweed, rough hawkbit, fairy flax, bird's-foot trefoil, salad burnet and ribwort plantain. Sheep's fescue is replaced throughout by red fescue.

The replacement of sheep's fescue by red fescue, and the relative abundance of Yorkshire fog accompanied by creeping bent and a range of calcicolous bryophytes indicate that this community can be adequately described in terms of its affinity with CG2c *Holcus lanatus* – *Trifolium repens* sub-community. The abundance of false brome is also indicative of this sub-community; however, it is not preferential.

Maritime species are represented by sea plantain, and the proximity and exposure to the sea indicate that this should be regarded as sub-maritime grassland with some affinity to grassland on magnesian limestone outcrops on the Durham Coast. It is noticeable that false brome is less abundant in this community where soft cliff slopes are stabilised, however, once erosion takes place and turves break up on their journey seaward false brome becomes much more common readily seeding into any bare ground created.

This community was encountered at North Landing and Thornwick Bay on cliff slopes which are eroding relatively rapidly in exposed, northwest facing locations associated with chalk cliffs. However, the community is best represented on the soft cliff resource at Speeton Sands where actively eroding slopes stretch some 250m inland at Middle Cliff, New Closes Cliff, Gill Cliff and Black Cliff.

At Speeton Sands the community is under pressure from Invasive Non-Native Species (INNS) throughout in particular by Montbretia and Shasta daisy.

Table 4 – Species recorded within this community are listed below.

Species	DAFOR 2021
Brachypodium sylvaticum	D
Festuca rubra	A
Rhytidiadelphus triquetrus	LA
Agrostis stolonifera	F
Calliergonella cuspidata	F
Centaurea nigra	F
Dactylis glomerata	F

Species	DAFOR 2021
Equisetum arvense	F
Holcus lanatus	F
Leontodon hispidus	F
Lotus corniculatus	F
Plantago lanceolata	F
Plantago maritima	F
Plantago media	F
Primula vulgaris	F
Trifolium pratense	F
Eurhynchium striatum	LF
Gymnadenia conopsea?	LF
Kindbergia praelonga	LF
Linum catharticum	LF
Prunella vulgaris	LF
Pseudoscleropodium purum	LF
Sanguisorba minor	LF
Teucrium scorodonia	LF
Viola sp	LF
Pilosella officinarum	LF

Species	DAFOR 2021
Anacamptis pyramidalis	LF
Carex flacca	O / LF
Angelica sylvestris	O
Brachythecium rutabulum	O
Campanula rotundifolia	O
Carex panicea	O
Cerastium fontanum	O
Heracleum sphondylium	O
Lathyrus pratensis	O
Mesoptychia turbinata	O
Ononis repens	O
Pellia endiviifolia	O
Rubus fruticosus	O
Rumex acetosa	O
Scabiosa columbaria	O
Trisetum flavescens	O
Veronica chamaedrys	O
Filipendula vulgaris	O
Anthyllis vulneraria	R

Species	DAFOR 2021
Arrhenatherum elatius	R
Cirsium palustre	R
Cirsium vulgare	R
Galium verum	R
Hypericum perforatum	R
Lophocolea bidentata	R
Parnassia palustris	R
Potentilla reptans	R
Pulicaria dysenterica	R
Schedonorus arundinaceus	R
Tussilago farfara	R
Carlina vulgaris	R

Table 5 – Quadrat data recorded in this community is detailed below, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Quadrat location - OS Grid TA	1498 7558	1524 7545	1568 7525	1438 7608	1430 7615		
Sward height (cm)	30	25	23	25	25		
Bare ground (%)	0	4	5	4	2		

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Festuca rubra	8	8	6	8	8	V	(6-8)
Brachypodium sylvaticum	8	7	9	5	4	V	(4-9)
Lotus corniculatus	3	4	2	4	2	V	(2-4)
Centaurea nigra	4	3	3		4	IV	(3-4)
Holcus lanatus	3	4	3		3	IV	(3-4)
Pseudoscleropodium purum	3	4	3		3	IV	(3-4)
Plantago lanceolata			2	3	4	III	(2-4)
Leontodon hispidus		2	3	3		III	(2-3)
Dactylis glomerata		2		2	2	III	(2_)
Rubus fruticosus	2	4			1	III	(1-4)
Cirsium palustre	2	2			1	III	(1-2)
Lathyrus pratensis	2	2			1	III	(1-2)
Prunella vulgaris		2		1	2	III	(1-2)
Angelica sylvestris	1	1			2	II	(1-2)
Eurhynchium striatum			4		3	II	(3-4)
Carex flacca		3		3		II	(3_)
Tussilago farfara				2	4	II	(2-4)

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Equisetum arvense	2	3				II	(2-3)
Trifolium pratense			2	3		II	(2-3)
Heracleum sphondylium			2		2	II	(2_)
Plantago media		1			3	II	(1-3)
Sanguisorba minor		3			1	II	(1_3)
Gymnadenia conopsea?	2	1				II	(1_2)
Rhytidiadelphus triquetrus			4			I	(4_)
Calliergonella cuspidata	3					I	(3_)
Pulicaria dysenterica	3					I	(3_)
Teucrium scorodonia			3			I	(3_)
Pellia endiviifolia				3		I	(3_)
Mesoptychia turbinata				3		I	(3_)
Viola sp					3	I	(3_)
Kindbergia praelonga					3	I	(3_)
Arrhenatherum elatius	2					I	(2_)

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Schedonorus arundinaceus		2				I	(2_)
Galium verum					2	I	(2_)
Ononis repens					2	I	(2_)
Rumex acetosa					2	I	(2_)
Primula vulgaris			2			I	(2_)
Veronica chamaedrys			2			I	(2_)
Agrostis stolonifera				2		I	(2_)

Community; CG2c* *Festuca ovina – Helictotrichloa pratesis* grassland; *Holcus lanatus – Trifolium repens* sub-community

Table 6 – CG2c* Community Attributes.

Attribute	NVC Code – CG2c
Broad habitat type	Calcareous Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Calcareous Grassland
UKHabs code	g2a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

A species-rich grassland community allied to CG2c was recorded and has been allocated the code CG2*. The community is formed in two differing ways. Where erosion is active on soft cliffs at Speeton Sands then bare ground revealed during erosion near stable stands of CG2c is colonised by the species characteristic of this calcareous grassland, similarly where stable stands of CG2c are subject to erosion and bare ground appears, then CG2c* can also form. Essentially the community can be viewed as a precursor to the closed calcareous grassland CG2c where slopes remain stable for long enough to allow this to happen.

The floristics are very similar, however, opportunists spreading by vegetative means such as creeping bent, field horsetail, glaucous sedge, common fleabane and colt's-foot are more frequent. Similarly more diminutive and short-lived species of calcareous turf such as fairy flax, small scabious, harebell, eyebright and rough hawkbit are more prominent. Grass-of-Parnassus thrives in damper expressions, and a number of species were encountered only in this community including autumn gentian and trailing St John's-wort. Meadow oat-grass was also recorded.

Dependent on the dynamic soft cliff system, this species-rich sub-maritime grassland has high nature conservation value and further study to consolidate its position in terms of NVC is recommended. As is the case with CG2c, this community is vulnerable to invasion by INNS.

Table 7 – Species recorded in this community are listed below.

Species	DAFOR
Ctenidium molluscum	LA
Carex flacca	F / LA
Pseudoscleropodium purum	F / LA
Agrostis stolonifera	F
Brachypodium sylvaticum	F
Calliergonella cuspidata	F
Centaurea nigra	F

Species	DAFOR
Dactylis glomerata	F
Festuca rubra	F
Leontodon hispidus	F
Linum catharticum	F
Plantago lanceolata	F
Pulicaria dysenterica	F
Trifolium pratense	F
Tussilago farfara	F
Equisetum arvense	LF
Gentianella amarella	LF
Kindbergia praelonga	LF
Prunella vulgaris	LF
Parnassia palustris	O / LF
Ajuga reptans	O
Angelica sylvestris	O
Carlina vulgaris	O
Cerastium fontanum	O
Cirsium palustre	O
Danthonia decumbens	O

Species	DAFOR
Euphrasia nemorosa	O
Holcus lanatus	O
Hypochaeris radicata	O
Jacobaea vulgaris	O
Medicago lupulina	O
Mesoptychia turbinata	O
Rubus fruticosus	O
Trichostomum flavescens	O
Lotus corniculatus	O
Anthyllis vulneraria	O
Campanula rotundifolia	O
Scabiosa columbaria	O
Aneura pinguis	R
Anthoxanthum odoratum	R
Arrhenatherum elatius	R
Asplenium scolopendrium	R
Dryopteris filix-mas	R
Fissidens dubius	R
Helictotrichon pratense	R

Species	DAFOR
Helminthotheca echioides	R
Hypericum humifusum	R
Juncus conglomeratus	R
Plantago maritima	R
Plantago media	R
Potentilla reptans	R
Ranunculus repens	R
Rumex acetosa	R
Sanguisorba minor	R
Schedonorus arundinaceus	R
Taraxacum officinale agg	R

Table 8 – The quadrat data recorded in this community is detailed below, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Quadrat location – OS Grid TA	1421 7620	1468 7573	1489 7565	1525 7545	1439 7606		
Sward Height (cm)	10	14	18	8	9		
Bare ground (%)	40	8	40	40	65		

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Festuca rubra	4	5	6	4	3	V	(3-6)
Tussilago farfara	1	2	5	1	4	V	(1-5)
Brachypodium sylvaticum	5	6	6		5	IV	(5-6)
Carex flacca	4	5		5	3	IV	(3-5)
Equisetum arvense	3	3	3	4		IV	(3-4)
Centaurea nigra	3	4	2	3		IV	(2-4)
Leontodon hispidus	2	3		4	3	IV	(2-4)
Agrostis stolonifera	4	4		1	4	IV	(1-4)
Cirsium palustre	2	2	3		1	IV	(1-3)
Pulicaria dysenterica	2		3	1	3	IV	(1-3)
Trifolium pratense	3	4		3		III	(3-4)
Trichostomum flavescens	3	3	3			III	(3_)
Dactylis glomerata	2	2	4			III	(2-4)
Plantago lanceolata	3	3			2	III	(2-3)
Linum catharticum	2	3		3		III	(2-3)
Parnassia palustris		2	3		3	III	(2-3)
Medicago lupulina	1	2		2		III	(1-2)
Jacobaea vulgaris	2		1		2	III	(1-2)

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Angelica sylvestris	1	1	1			III	(1_)
Calliergonella cuspidata	3	3				II	(3_)
Mesoptychia turbinata		3	3			II	(3_)
Euphrasia nemorosa	3			3		II	(3_)
Prunella vulgaris	3				2	II	(2-3)
Hypericum humifusum	3	2				II	(2-3)
Holcus lanatus	2		2			II	(2_)
Hypochaeris radicata	2	2				II	(2_)
Fissidens dubius	2	2				II	(2_)
Carlina vulgaris			1	2		II	(1-2)
Rubus fruticosus	1	1				II	(1_)
Rumex acetosa	1	1				II	(1_)
Cerastium fontanum	1	1				II	(1_)
Ctenidium molluscum				8		I	(8_)
Danthonia decumbens				6		I	(6_)
Anthoxanthum odoratum	5					I	(5_)
Helictotrichon pratense				5		I	(5_)
Kindbergia praelonga			4			I	(4_)

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Pseudoscleropodium purum	4					I	(4_)
Lotus corniculatus				3		I	(3_)
Sanguisorba minor				3		I	(3_)
Ajuga reptans	3					I	(3_)
Gentianella amarella				3		I	(3_)
Arrhenatherum elatius		2				I	(2_)
Schedonorus arundinaceus		2				I	(2_)
Asplenium scolopendrium			2			I	(2_)
Dryopteris filix-mas			2			I	(2_)
Aneura pinguis			2			I	(2_)
Juncus conglomeratus	1					I	(1_)
Ranunculus repens			1			I	(1_)
Potentilla reptans			1			I	(1_)
Helminthotheca echioides					1	I	(1_)
Taraxacum officinale agg					1	I	(1_)

AR** *Arrhenatherum* / *Teucrium* Scree Slope Vegetation

Table 9 – AR Community Attributes.**

Attribute	NVC Code – None (AR**)
Broad Habitat Type	Calcareous Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Calcareous Grassland
UKHabs Code	g2a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Not as currently described
Status	Para-maritime

This community was identified and described by Milliken and Pendry 2002 and occurs on the chalk outcrops in the north of the site at Speeton Cliffs extending from the first outcrop of red chalk at Speeton Gap east to Hailstone Shelves where the chalk cliffs become markedly steeper. This is a calcareous grassland on chalk talus and scree which has been stabilised for some time. There is much bare ground, chalk out crops throughout and an abundance of bryophytes characteristic of base-rich situations.

Community constants are red fescue, wood sage, rough hawkbit, false oat-grass and hogweed. The northerly aspect facilitates exuberant growth of bryophytes including big shaggy moss, comb moss and neat feather-moss. Scattered throughout at low frequency are wild thyme, orchids (likely early purple orchid and pyramidal orchid), herb Robert, cowslip and carline thistle. Mouse-ear hawkweed and harebell can be prominent. Access to eastern expressions was not possible and it is likely that further species could be added to the list below.

Whilst false-oat grass and hogweed tend to be poorly grown and never dominant, the character of the vegetation owes much to the Arrhenatherion elatioris, a guild of ungrazed grasslands on free-draining substrates represented predominantly by stands on eutrophic soils in the UK (MG1 *Arrhenatherum elatius* grassland). However, on the Continent such grasslands are frequently maintained as meadows, and in the Yorkshire Dales and elsewhere in the uplands on limestone (notably on Dalradian soils in Scottish Highlands) Rodwell has described the northern upland hay meadow in terms of MG2 *Arrhenatherum elatius* – *Filipendula ulmaria* tall-herb grassland. AR** is surely the lowland analogue of MG2 with wild angelica and marsh thistle lending something of the physiognomy of the upland hay meadows.

Table 10 – The following species were recorded in this community.

Species	DAFOR
Festuca rubra	A / LD
Ctenidium molluscum	A
Rhytidiadelphus triquetrus	A
Arrhenatherum elatius	F / LA
Carex flacca	F / LA
Teucrium scorodonia	F / LA
Agrostis stolonifera	F
Campanula rotundifolia	F
Holcus lanatus	F
Homalothecium lutescens	F
Hypnum lacunosum	F
Heracleum sphondylium	F
Leontodon hispidus	F
Pseudoscleropodium purum	F
Eurhynchium striatum	LF
Pilosella officinarum	O / LF
Angelica sylvestris	O
Carlina vulgaris	O

Species	DAFOR
Cirsium palustre	O
Dactylorhiza sp	O
Dicranum scoparium	O
Eurhynchium striatum	O
Jacobaea vulgaris	O
Primula veris	O
Primula vulgaris	O
Rumex acetosa	O
Dryopteris filix-mas	O
Asplenium scolopendrium	O
Anacamptis pyramidalis?	R
Anthoxanthum odoratum	R
Anthyllis vulneraria	R
Calliergonella cuspidata	R
Geranium robertianum	R
Lathyrus pratensis	R
Linum catharticum	R
Lotus corniculatus	R
Orchis mascula?	R

Species	DAFOR
Plagiochila porelloides	R
Plantago lanceolata	R
Prunella vulgaris	R
Ranunculus acris	R
Rhytidiadelphus squarrosus	R
Rubus fruticosus agg.	R
Sonchus asper	R
Taraxacum officinale agg	R
Thymus drucei	R
Tussilago farfara	R
Viola sp	R

Table 11 – The following quadrat data was recorded in this community; blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Quadrat location - OS Grid TA	1625 7508	1606 7511	1601 7506	1592 7513	1587 7520		
Sward height (cm)	20	22	12	14	15		
Bare ground (%)	20	2	4	5	15		

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Festuca rubra	7	8	4	8	6	V	(4-8)
Rhytidiadelphus triquetrus	3	7	8	4	4	V	(3-8)
Ctenidium molluscum	3	3	4	5	3	V	(3-5)
Teucrium scorodonia	5	4	2	3	4	V	(2-5)
Leontodon hispidus	2	3	4	3	2	V	(2-4)
Pseudoscleropodium purum	4	4	4		3	IV	(3-4)
Arrhenatherum elatius	2	2	2		2	IV	(2_)
Heracleum sphondylium	2	2		2	2	IV	(2_)
Carex flacca		4	5		6	III	(4-6)
Hypnum lacunosum	3	3		4		III	(3-4)
Homalothecium lutescens	3		3		3	III	(3_)
Agrostis stolonifera	2			3	3	III	(2-3)
Campanula rotundifolia		2		2	3	III	(2-3)
Holcus lanatus		3	2	2		III	(2-3)
Cirsium palustre	1	1		2		III	(1-2)
Rumex acetosa	1	1	1			III	(1_)
Eurhynchium striatum	3	3				II	(3_)

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Primula vulgaris			3	3		II	(3_)
Dicranum scoparium			3		3	II	(3_)
Pilosella officinarum				2	5	II	(2-5)
Angelica sylvestris			2	2		II	(2_)
Dactylorhiza sp			2	2		II	(2_)
Jacobaea vulgaris		1			2	II	(1-2)
Primula veris				2	1	II	(1-2)
Carlina vulgaris				2	1	II	(1-2)
Calliergonella cuspidata	3					I	(3_)
Lotus corniculatus				3		I	(3_)
Prunella vulgaris				3		I	(3_)
Plagiochila porelloides		3				I	(3_)
Thymus drucei					3	I	(3_)
Rhytidiadelphus squarrosus					3	I	(3_)
Lathyrus pratensis				2		I	(2_)
Tussilago farfara	2					I	(2_)
Viola sp				2		I	(2_)
Geranium robertianum	2					I	(2_)

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Anacamptis pyramidalis?		2				I	(2_)
Orchis mascula?		2				I	(2_)
Anthoxanthum odoratum				2		I	(2_)
Plantago lanceolata	1					I	(1_)
Rubus fruticosus agg.				1		I	(1_)
Taraxacum officinale agg	1					I	(1_)
Ranunculus acris		1				I	(1_)
Sonchus asper			1			I	(1_)

M10 *Carex dioica – Pinguicula vulgaris* mire

Table 12 – M10 Community Attributes.

Attribute	NVC code – M10
Broad habitat type	Fen, Marsh and swamp
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Fen
UKHabs code	f2a7
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Para-maritime

There are a small number of base-rich springs and seepages throughout the soft cliff resource which give rise to M10 flushes characterised by small sedges, predominantly glaucous sedge. Grass of Parnassus is a community constant and was much in evidence during the survey along with colt's-foot, common fleabane, jointed rush and marsh thistle. Bryophytes form a hepatic mat in a number of locations featuring greasewort, endive pellia and fern-leaved hook-moss. A good example occurs at TN9.

The community occurs on soft cliffs west of Speeton Cliff to Reighton Gap as a dynamic community in time and space depending on constant erosion of the soft cliff to persist. Where the substrate stabilises for long periods more robust species such as rushes, hairy sedge and hairy willowherb become established and outcompete the more diminutive sedges and bryophytes. Due to their origins expressions of this community can be very limited and numerous examples occur in patches too small to map (e.g. TN10), and at Selwicks Bay (TN2). At the latter expression species recorded were glaucous sedge, false fox-sedge, marsh arrow-grass, jointed rush and common fleabane.

Due to their dynamic nature species associations vary considerably and depend on colonisation of flushed bare soil exposed during soft cliff erosion. As such the community is vulnerable to colonisation by INNS. These springs and flushes are of high conservation value and would benefit from frequent monitoring.

Table 13 – The following species were recorded in this community.

Species	DAFOR
Carex flacca	A / LD
Pulicaria dysenterica	F / LA
Agrostis stolonifera	F
Festuca rubra	F
Juncus articulatus	F
Parnassia palustris	F
Tussilago farfara	F
Dactylorhiza praetermissa (likely)	LF

Species	DAFOR
Equisetum arvense	LF
Cratoneuron filicinum	LF
Aneura pinguis	O
Brachypodium sylvaticum	O
Calliergonella cuspidata	O
Carex panicea	O
Didymodon fallax	O
Holcus lanatus	O
Juncus conglomeratus	O
Juncus inflexus	O
Kindbergia praelonga	O
Lathyrus pratensis	O
Leontodon hispidus	O
Lotus corniculatus	O
Mesoptychia turbinata	O
Pellia endiviifolia	O
Plantago lanceolata	O
Plantago media	O
Prunella vulgaris	O

Species	DAFOR
Trichostomum brachydontium	O
Trifolium pratense	O
Samolus valerandi	O
Triglochin palustris	O
Carex hirta	O
Linum catharticum	O
Potentilla anserina	O
Angelica sylvestris	R
Brachythecium rivulare	R
Carex hostiana	R
Carex otrubae	R
Carlina vulgaris	R
Centaurea nigra	R
Cirsium palustre	R
Dactylis glomerata	R
Pilosella officinarum	R
Rubus fruticosus agg	R
Schedonorus arundinaceus	R
Taraxacum officinale agg	R

Species	DAFOR
Triglochin maritimum	R

Table 14 – The following quadrat data was recorded for this community; blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Quadrat location - OS Grid TA	1471 7571	1489 7566	1501 7564	1513 7558	1549 7535		
Sward height (cm)	15	20	25	15	25		
Bare ground (%)	10	15	4	10	2		
Carex flacca	7	6	8	6	8	V	(6-8)
Tussilago farfara	8	5	3	5	3	V	(3-8)
Festuca rubra	3	3	4	5	6	V	(3-6)
Agrostis stolonifera	4	5	3	3	3	V	(3-5)
Pulicaria dysenterica	3	3	7	2	2	V	(2-7)
Parnassia palustris	3	3	2	3	3	V	(2-3)
Equisetum arvense	3	1	2	4	2	V	(1-4)

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Cirsium palustre	2	1	2	3	1	V	(1-3)
Juncus articulatus	4		4	3	3	IV	(3-4)
Trifolium pratense	2		2	2	2	IV	(2_)
Prunella vulgaris	1	2	2	2		IV	(1-2)
Carex panicea	3		3		3	III	(3_)
Leontodon hispidus		3		3	3	III	(3_)
Trichostomum brachydontium		3	3	3		III	(3_)
Lathyrus pratensis			3	2	3	III	(2-3)
Brachypodium sylvaticum	1	3	2			III	(1-3)
Plantago lanceolata	1		2		1	III	(1-2)
Holcus lanatus				2	4	II	(2-4)
Plantago media		2	2			II	(2_)
Aneura pinguis			2	2		II	(2_)

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Schedonorus arundinaceus	2	1				II	(1-2)
Juncus inflexus					4	I	(4_)
Triglochin maritimum			4			I	(4_)
Angelica sylvestris					3	I	(3_)
Dactylorhiza praetermissa (likely)				3		I	(3_)
Pellia endiviifolia				3		I	(3_)
Didymodon fallax	3					I	(3_)
Kindbergia praelonga			3			I	(3_)
Juncus conglomeratus					2	I	(2_)
Lotus corniculatus	2					I	(2_)
Carlina vulgaris		2				I	(2_)
Pilosella officinarum		2				I	(2_)

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Taraxacum officinale agg		2				I	(2_)
Mesoptychia turbinata				2		I	(2_)
Dactylis glomerata		1				I	(1_)
Rubus fruticosus agg			1			I	(1_)

M27b *Filipendula ulmaria – Angelica sylvestris* mire; *Urtica dioica – Vicia cracca* sub-community

Table 15 – M27b Community Attributes.

Attribute	NVC Code – M27b
Broad habitat type	Fen, Marsh and Swamp
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Fen
UKHabs code	f2a
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Para-maritime

Dominated by meadowsweet, this community is characterised by a number of associates including great willowherb, false oat-grass and marsh thistle. This combination of species in damp areas dominated by meadowsweet is consistent with the NVC description for M27b *Filipendula ulmaria – Angelica sylvestris* mire; *Urtica dioica – Vicia cracca* sub-community.

M27 is characteristic of moist, circum-neutral soils occurring in ungrazed locations in lowland England. A certain amount of eutrophication is tolerated, and exuberant growth is typical where agricultural run-off occurs onto the cliff. Common nettle, goosegrass and curled dock are preferential in these stands.

M27 occurs in very limited expressions on the soft cliff at Speeton Sands associated with dynamic wetlands and wet woodland (e.g. TN16 and TN42).

Table 16 – One quadrat was recorded for M27, the results are as follows.

Species	Q1	Frequency	Abundance
Quadrat location - OS Grid TA	1416 7632		
Sward height (cm)	110		
Bare ground (%)	0		
Filipendula ulmaria	7	V	(7_)
Juncus inflexus	5	V	(5_)
Pulicaria dysenterica	5	V	(5_)
Angelica sylvestris	4	V	(4_)
Cirsium arvense	4	V	(4_)
Lathyrus pratensis	3	V	(3_)
Rubus fruticosus	3	V	(3_)

M38 *Palustriella commutate – Carex nigra* spring

Table 17 – M38 Community Attributes

Attribute	NVC code – M38
Broad habitat type	Fen, Marsh and swamp
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Fen
UKHabs code	f2a6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Para-maritime

These are important features of limited extent associated with base-rich springs throughout the survey area. Each expression encountered has been recorded with a Target Note and tabulated below.

Table 18 – Target notes related to this NVC type.

Target Note	Feature
TN1	Large tufa spring with much fern-leaved hook-moss *Cratoneuron filicinum*. Spring extends to the beach in this sheltered location (North Sands, Sewerby).
TN39	Bryophyte rich spring with pointed spear-moss *Calliergonella cuspidata*, curly crisp-moss *Trichostomum crispulum*, various orchids and brookweed *Samolus valerandi*.
TN40	M38 spring with curled hook-moss *Palustriella commutata*, endive pellia *Pellia endiviifolia*, brookweed, glaucous sedge, jointed rush, hard rush, field horsetail and marsh thistle.

MC6 *Atriplex prostrata – Beta vulgaris* ssp. Maritima sea-bird cliff community

Table 19 – MC6 Community Attributes

Attribute	NVC code – MC6
Broad habitat type	Supralittoral Rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime Cliff and Slope
UKHabs code	s2a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime

This vegetation forms where there is a combination of high maritime influence and eutrophication of the substrate due to nesting or roosting sea birds. The community occurs on stacks and inaccessible cliff ledges, although where seabird nesting is intense the level of disturbance is too high for seedlings to establish. Where strong updraughts occur bringing maritime influence and airborne nutrient input from seabird colonies, the community may be found established on the cliff top (e.g. TN45).

As would be expected, MC6 is very much in evidence on Bempton Cliffs where the gannet colony occurs. In expressions here, sea mayweed is joined by red campion and perennial sow-thistle. The community is apparent east of Bempton Cliffs and occurs at suitable locations on Buckton Cliffs. In the observed expressions, sea mayweed is abundant usually with spear-leaved orache.

MC8a *Festuca rubra – Armeria maritima* grassland; Typical sub-community

Table 20 – MC8a Community Attributes

Attribute	NVC code – MC8a
Broad habitat type	Supralittoral Rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime Cliff and Slope
UKHabs code	s2a5 and s2a6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime

Two community constants are recorded in the description offered by Rodwell, red fescue and thrift. The former is always prominent in MC8 grasslands of the Yorkshire coast, however, the latter is usually absent. During this survey MC8a was recorded without thrift on the south-facing aspect of Flamborough Head, but occurs on the north-facing aspect from the lighthouse (TA25777072) to Buckton Cliff. The Typical sub-community has no special associates, however, preferential species for the community as a whole are numerous including sea plantain, common scurvy-grass, yarrow and curly crisp-moss.

It was noted that where slippage has taken place and bare ground revealed, sea plantain, common ragwort and rough hawkbit are preferential. Species associated with less maritime expressions are black knapweed, hoary plantain and harebell.

On the south-facing aspect of Flamborough Headland (from Sewerby to the lighthouse at Flamborough Head) the community is limited to sporadic expressions in particularly exposed locations where maritime influence is enhanced. Cliff edge patches at Sewerby are maintained by a combination of exposure to maritime influence and trampling by walkers at viewpoints.

Notably, the community is widespread to the east of the lighthouse at Flamborough Head as far as Dane's Dyke (north). To the east of Dane's Dyke (north) the community is restricted to a narrow band at the top of the cliff where maritime influence is sufficient. Whilst restricted in distribution MC8a at Bempton Cliffs is species rich and features primrose, cowslip, northern marsh orchid, southern marsh orchid, agrimony, common restharrow and pyramidal orchid (pers comm). The community peters out at Speeton Cliff where maritime influence is once again low.

Table 21 – The following species were recorded in this community.

Species	DAFOR
Trifolium pratense	O
Veronica chamaedrys	O
Arrhenatherum elatius	R
Beta vulgaris subsp. maritima	R
Campanula rotundifolia	R
Cerastium fontanum	R
Cirsium arvense	R
Convolvulus arvensis	R
Daucus carota	R
Equisetum arvense	R
Field horsetail	R
Lysimachia maritima	R

Species	DAFOR
Heracleum sphondylium	R
Holcus lanatus	R
Jacobaea vulgaris	R
Ononis repens	R
Plantago coronopus	R
Primula vulgaris	R
Prunella vulgaris	R
Rumex acetosa	R
Scorzoneroides autumnalis	R
Silene dioica	R
Sonchus asper	R
Stellaria graminea	R
Taraxacum agg.	R
Tripleurospermum maritimum	R
Tussilago farfara	R
Viola sp.	R

Table 22 – The following quadrat data was recorded for this community; blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Quadrat location - OS Grid TA	2020 6870	2394 6924	2547 7004	2507 7142	2298 7243		
Sward height (cm)	15	18	19	18	14		
Bare ground	0	2	2	4	2		
Festuca rubra	10	10	8	9	10	V	(8-10)
Plantago lanceolata	3	4	5	2	3	V	(2-5)
Dactylis glomerata	2	3	2	2		IV	(2-3)
Agrostis stolonifera	4		4	3	1	IV	(1-4)
Cochlearia officinalis		2	3	2		III	(2-3)
Plantago maritima				5	4	II	(4-5)
Lotus corniculatus				4	3	II	(3-4)
Centaurea nigra		2			2	II	(2_)

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Lathyrus pratensis	3	2				II	(2-3)
Achillea millefolium	2	3				II	(2-3)
Armeria maritima				4		I	(4_)
Kindbergia praelonga					3	I	(3_)
Galium verum		3				I	(3_)
Trichostomum crispulum					3	I	(3_)
Ononis repens			3			I	(3_)
Sonchus arvensis				3		I	(3_)
Potentilla reptans		3				I	(3_)
Campanula rotundifolia		3				I	(3_)
Calliergonella cuspidata					2	I	(2_)
Plantago coronopus				2		I	(2_)
Stellaria graminea			2			I	(2_)
Daucus carota			2			I	(2_)
Cirsium arvense	2					I	(2_)
Heracleum sphondylium					1	I	(1_)
Arrhenatherum elatius		1				I	(1_)
Jacobaea vulgaris					1	I	(1_)
Trifolium pratense				1		I	(1_)
Primula vulgaris				1		I	(1_)
Silene dioica				1		I	(1_)
Rumex acetosa	1					I	(1_)
Convolvulus arvensis	1					I	(1_)

MC8f *Festuca rubra – Armeria maritima* grassland; *Anthyllis vulneraria* sub-community

Table 23 – MC8f Community Attributes

Attribute	NVC code – MC8f
Broad habitat type	Supralittoral Rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime Cliff and Slope
UKHabs code	S2a5 and s2a6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime

A maritime cliff grassland community, MC8f is found on soft cliffs where slopes are partially stabilised and is a natural succession on free-draining substrates on soft cliff colonised by MG11. There are also limited expressions where erosion is taking place on low chalk cliffs south of Breil Nook, at North Landing and Thornwick Nab. On soft cliff creeping bent can form a significant part of the graminoid element, however, the sward is generally dominated by red fescue. The sub-community preferential kidney vetch was recorded throughout, often in abundance. Colt's-foot and creeping bent are often frequent in this community, and the latter can appear to have significant coverage in late summer.

In common with the MC8 recorded by Milliken and Pendry (2002), no thrift was recorded during these surveys, suggesting that on further analysis this community may well be recognised as a distinct maritime community of Yorkshire's east coast.

In the survey area this maritime grassland community supports a suite of calcicoles including rough hawkbit, glaucous sedge and hoary plantain as well as often abundant calcicolous bryophytes such as comb-moss and great plait-moss. In contrast to expressions further north (Filey to Red Cliff), false brome is rare in this community.

On the soft cliffs at Speeton Sands it is likely that some stands of MC8f have been derived from CG2 calcareous grassland as turfs move down-slope into situations more exposed to salt spray, the incremental movement allowing gaps for kidney vetch and sea plantain to colonise.

Where MC8f is colonising loose talus at Speeton Cliff kidney vetch is abundant, however, as slopes stabilise red fescue and robust pleurocarpous mosses increase in dominance and wood sage and hogweed appear. This community can form quite a dense sward of red fescue with little bare ground over time, and appears to stabilise even very steep slopes allowing the bryophyte flora to flourish on north-east facing slopes. During the survey orchids were recorded, often in profusion, however, due to the timing of the survey identification was not possible, however, at TA15407539 both early purple orchid and fragrant orchid are suspected.

Due to its often open character this community forms a niche for ‘soft cliff species’, i.e. those species capable of sustainably colonising bare ground as it forms on the soft cliff slope. Soft cliff species are not dependent on input from vegetation communities at the top of the cliff, and consequently are less under threat from simplification of vegetation communities adjacent to the cliff due to agricultural intensification. However, this makes the community more at risk of invasion by INNS.

Table 24 – The following species were recorded in MC8f.

Species	DAFOR
Festuca rubra	D
Anthyllis vulneraria	A / LD
Agrostis stolonifera	F
Holcus lanatus	F
Leontodon hispidus	F
Plantago lanceolata	F
Trichostomum crispulum	F
Trifolium pratense	F
Tussilago farfara	F
Calliergonella cuspidata	LF
Carex flacca	LF
Ctenidium molluscum	LF
Hypnum lacunosum	LF
Lotus corniculatus	LF
Plantago maritima	LF
Plantago media	LF
Rhytidiadelphus triquetrus	LF
Orchis mascula?	LF
Pilosella officinarum	vLF
Angelica sylvestris	O
Centaurea nigra	O
Cirsium palustre	O
Dactylorhiza sp	O
Eurhynchium striatum	O
Homalothecium lutescens	O

Species	DAFOR
Kindbergia praelonga	O
Lathyrus pratensis	O
Linum catharticum	O
Pellia endiviifolia	O
Prunella vulgaris	O
Geranium robertianum	O
Gymnadenia conopsea?	O
Aneura pinguis	R
Arrhenatherum elatius	R
Bellis perennis	R
Brachypodium sylvaticum	R
Campanula rotundifolia	R
Centaurium erythraea	R
Cerastium fontanum	R
Dactylis glomerata	R
Dicranella heteromalla	R
Didymodon fallax	R
Helminthotheca echioides	R
Heracleum sphondylium	R
Jacobaea erucifolia	R
Jacobaea vulgaris	R
Lophocolea bidentata	R
Parnassia palustris	R
Pseudoscleropodium purum	R
Pulicaria dysenterica	R
Rubus fruticosus agg.	R
Sanguisorba minor	R
Schedonorus arundinaceus	R
Sonchus asper	R
Viola sp	R
Neckera complanata	R
Teucrium scorodonia	R

Species	DAFOR
Hypochaeris radicata	R

Table 25 – The following quadrat data was recorded for MC8f, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Frequency	Abundance
Quadrat location - OS Grid TA	1540 7539	2383 7202	1475 7585	1499 7565	1626 7508	1625 7509	1611 7514		
Sward height (cm)	20	14	15	14	12	15	16		
Bare ground (%)	0	8	10	10	25	10	35		
Festuca rubra	9	7	9	7	8	9	7	V	(7-9)
Anthyllis vulneraria	5	4	5	4	8	7	6	V	(4-8)
Agrostis stolonifera	3	6	4	2	3	2	4	V	(2-6)
Trichostomum crispulum	4		3	3	3		3	IV	(3-4)
Leontodon hispidus	2	3		3	3	4		IV	(2-4)
Trifolium pratense	2	4	3	2				III	(2-4)
Tussilago farfara		5		2	1		2	III	(1-5)
Holcus lanatus	3	4	1			2		III	(1-4)
Plantago lanceolata	3	3	2	1				III	(1-3)
Lotus corniculatus	5			3			4	III	(3-5)
Carex flacca			3	4				II	(3-4)
Ctenidium molluscum	4						3	II	(3-4)
Hypnum lacunosum				4		3		II	(3-4)
Calliergonella cuspidata						3	3	II	(3_)
Pellia endiviifolia	3		3					II	(3_)
Eurhynchium striatum	3					3		II	(3_)
Centaurea nigra	2			2				II	(2_)

Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Frequency	Abundance
Prunella vulgaris		2	2					II	(2_)
Lathyrus pratensis		1	2					II	(1-2)
Cirsium palustre	1		1					II	(1_)
Angelica sylvestris	1		1					II	(1_)
Plantago maritima				4				I	(4_)
Plantago media				4				I	(4_)
Dactylis glomerata	3							I	(3_)
Lophocolea bidentata						3		I	(3_)
Pseudoscleropodium purum						3		I	(3_)
Kindbergia praelonga		3						I	(3_)
Aneura pinguis		3						I	(3_)
Didymodon fallax			3					I	(3_)
Dactylorhiza sp	2							I	(2_)
Sanguisorba minor	2							I	(2_)
Campanula rotundifolia					2			I	(2_)
Viola sp						2		I	(2_)
Dicranella heteromalla						2		I	(2_)
Arrhenatherum elatius	1							I	(1_)
Heracleum sphondylium						1		I	(1_)
Rubus fruticosus agg.			1					I	(1_)
Jacobaea erucifolia				1				I	(1_)
Jacobaea vulgaris		1						I	(1_)
Schedonorus arundinaceus			1					I	(1_)
Helminthotheca echioides							1	I	(1_)

MC9b *Festuca rubra – Holcus lanatus* maritime grassland; *Dactylis glomerata* sub-community

Table 26 – MC9b Community Attributes

Attribute	NVC Code – MC9b
Broad habitat type	Supralittoral Rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime Cliff and Slope
UKHabs code	s2a5 and s2a6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime

Community constants red fescue, Yorkshire fog and ribwort plantain are all well represented in MC9b encountered during the survey, however, thrift was not recorded in this community. Cock's-foot is also a community constant and coupled with the prominence of common sorrel, the floristics suggest most affinity with MC9b.

MC9b is a maritime cliff grassland community in locations where there is less overt maritime influence, MC9b is found on soft cliffs generally on deeper soils and shallower slopes than MC8. In the current study expressions were recorded from Flamborough Head west to Danes Dyke (north). Further west the cliffs are perhaps too high to be exposed to sufficient maritime influence to support extensive MC9b.

On high cliffs (e.g. Bempton Cliffs and Buckton Cliffs) the reduced maritime influence due to vertical elevation may be further masked by eutrophication either from fertiliser drift from arable farmland or due to nesting bird activity. Where eutrophication takes place the community becomes overwhelmed by coarse grasses and is best described in terms of MG1 *Arrhenatherum elatius* grassland. Eutrophication due to nesting birds at Bempton Cliffs also leads to the appearance of sea mayweed in MC9b.

MC9b was also encountered at Speeton Cliff and on soft cliff at Speeton Sands to Reighton Gap. In these expressions a number of species appear associated with the erosion of soft cliff causing pockets to open up where colonising species can thrive. Species in MC9b confined to soft cliff include marsh thistle, common fleabane, field horsetail and yellow starry feather-moss.

Sheltered expressions either on cliff tops or sheltered by topography support wild angelica, hoary plantain and primrose.

At Thornwick Bay there is much MC9b often in close proximity to slipping turves of calcareous grassland leading to a community with floristics of both. The expression above the beach at Thornwick Bay appears to have colonised bare ground created by perched soft cliff erosion. Common restharrow is present along with calcicoles including lady's-bedstraw, glaucous sedge, yellow starry feather-moss and hoary plantain and soft cliff

colonising species such as common fleabane, creeping cinquefoil and field horsetail. This area of grassland demonstrates the subtle interplay of calcareous substrate, soft cliff erosion characteristics and maritime influence.

Table 27 – The following species were recorded in MC9b.

Species	DAFOR
Festuca rubra	D
Agrostis stolonifera	F
Dactylis glomerata	F
Holcus lanatus	F
Hypochaeris radicata	F
Plantago lanceolata	F
Rumex acetosa	F
Calliergonella cuspidata	LF
Pseudoscleropodium purum	LF
Rhinanthus minor	LF
Carex flacca	vLF
Leontodon hispidus	vLF
Plantago maritima	vLF
Achillea millefolium	O
Arrhenatherum elatius	O
Brachythecium rutabulum	O
Centaurea nigra	O
Cerastium fontanum	O
Cirsium arvense	O
Cochlearia officinalis	O
Dactylorhiza sp	O
Festuca rubra ssp. juncea	O
Heracleum sphondylium	O
Kindbergia praelonga	O
Lotus corniculatus	O
Plantago media	O
Potentilla reptans	O

Species	DAFOR
Primula vulgaris	O
Prunella vulgaris	O
Sonchus arvensis	O
Trichostomum crispulum	O
Trifolium pratense	O
Campylium stellatum	O
Angelica sylvestris	R
Anthoxanthum odoratum	R
Equisetum arvense	R
Galium verum	R
Helminthotheca echioides	R
Jacobaea vulgaris	R
Lathyrus pratensis	R
Lolium perenne	R
Ononis repens	R
Scorzoneroides autumnalis	R
Trifolium repens	R
Tripleurospermum maritimum	R
Tussilago farfara	R
Vicia hirsuta	R
Cirsium vulgare	R
Pulicaria dysenterica	R
Cirsium palustre	R

Table 28 – The following quadrat data was collected for MC9b, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Q6	Frequency	Abundance
Quadrat location - OS Grid TA	**2577 7068**	**2486 7156**	**2462 7190**	**2429 7201**	**2335 7217**	**1550 7529**		
Sward height (cm)	**13**	**16**	**20**	**20**	**23**	**20**		
Bare ground (%)	**2**	**0**	**0**	**0**	**4**	**2**		
Festuca rubra	8	9	8	8	8	8	V	(8-9)

Species	Q1	Q2	Q3	Q4	Q5	Q6	Frequency	Abundance
Holcus lanatus	4	7	3	4	6	5	V	(3-7)
Plantago lanceolata	2	2	4	4	2	2	V	(2-4)
Agrostis stolonifera	3	3		3	3		IV	(3_)
Dactylis glomerata		2	4	2	2		IV	(2-4)
Hypochaeris radicata	1	2	3	2			IV	(1-3)
Cerastium fontanum	1		3	3			III	(1-3)
Rumex acetosa		2	1	2			III	(1-2)
Jacobaea vulgaris	1		1		1		III	(1_)
Kindbergia praelonga	4					3	II	(3-4)
Lotus corniculatus	3					3	II	(3_)
Rhinanthus minor			3	3			II	(3_)
Trifolium pratense				3		2	II	(2-3)
Sonchus arvensis		3				2	II	(2-3)
Cirsium arvense		2				2	II	(2_)
Heracleum sphondylium				2	2		II	(2_)
Cochlearia officinalis	2				2		II	(2_)
Achillea millefolium		2	2				II	(2_)
Primula vulgaris					2	2	II	(2_)
Equisetum arvense					2	2	II	(2_)
Prunella vulgaris				1		2	II	(1-2)
Plantago maritima	6						I	(6_)
Leontodon hispidus						4	I	(4_)
Pseudoscleropodium purum						4	I	(4_)
Trichostomum crispulum	3						I	**(3_)**
Anthoxanthum odoratum						3	I	**(3_)**
Calliergonella cuspidata						3	I	**(3_)**
Centaurea nigra				2			I	(2_)
Tussilago farfara					2		I	(2_)

Species	Q1	Q2	Q3	Q4	Q5	Q6	Frequency	Abundance
Vicia hirsuta			2				I	(2_)
Scorzoneroides autumnalis				2			I	(2_)
Brachythecium rutabulum					2		I	(2_)
Angelica sylvestris						2	I	(2_)
Trifolium repens	1						I	(1_)
Helminthotheca echioides			1				I	(1_)
Lathyrus pratensis						1	I	(1_)

MC9e *Festuca rubra – Holcus lanatus* maritime grassland; *Anthoxanthum odoratum* sub-community

Table 29 – MC9e Community Attributes.

Attribute	NVC Code – MC9e
Broad habitat type	Supralittoral Rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime Cliff and Slope
UKHabs code	s2a5 and s2a6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime

Community constants red fescue, Yorkshire fog and ribwort plantain are all well represented in MC9e encountered during the survey, however, sweet vernal-grass and common bent are also constant suggesting affinity with MC9e. The placing is not considered a good fit overall and a number of calcicoles are present including lady's-bedstraw, glaucous sedge and salad burnet. A placing as CG10a *Festuca ovina – Agrostis capillaris – Thymus praecox* grassland *Trifolium repens – Luzula campestris* sub-community was considered, however the physiognomy of this northern expression of calcareous grassland is generally quite different to the community encountered.

This community was recorded as a single, quite extensive, expression on the top of Speeton Cliff, and is associated with an ancient earthwork at the top of the cliff where unimproved grassland persists. Past disturbance is likely to have had a bearing on the

grassland species mix having components reflecting maritime influence on a disturbed calcareous grassland.

Table 30 – The following species were recorded in this community.

Species	DAFOR
Festuca rubra	D
Agrostis capillifolium	A
Anthoxanthum odoratum	A
Holcus lanatus	A
Plantago lanceolata	F
Dactylis glomerata	F
Prunella vulgaris	F
Achillea millefolium	F
Angelica sylvestris	F
Centaurea nigra	F
Campanula rotundifolia	F
Leontodon hispidus	F
Primula veris	F
Galium verum	F
Filipendula vulgaris	F
Sanguisorba minor	F
Carex flacca	O
Heracleum sphondylium	O
Cirsium palustre	O
Viola sp	O
Veronica chamaedrys	O
Calliergonella cuspidata	O
Pseudoscleropodium purum	O
Veronica serpyllifolia	O
Rumex acetosa	R
Cirsium arvense	R
Helminthotheca echioides	R

Table 31 – The following quadrat data was collected in this community, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Frequency	Abundance
Primula veris	3	2		IV	(1-2)
Galium verum	3		2	IV	(2_)
Filipendula vulgaris		3	2	IV	(2_)
Sanguisorba minor		3	2	IV	(2_)
Carex flacca		2	2	IV	(4-6)
Heracleum sphondylium	2		2	IV	(2_)
Cirsium palustre	2		1	IV	(1-2)
Viola sp	1		2	IV	(2_)
Veronica chamaedrys	1	1		IV	(2_)
Calliergonella cuspidata		3		II	(3_)
Pseudoscleropodium purum		3		II	(3-4)
Veronica serpyllifolia			2	II	(2_)
Rumex acetosa			1	II	(1_)
Cirsium arvense	1			II	(2_)

MC10a *Festuca rubra – Plantago* spp. maritime grassland *Armeria maritima* sub-community

Table 32 – MC10a Community Attributes

Attribute	NVC Code – MC10a
Broad habitat type	Supralittoral Rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime Cliff and Slope
UKHabs code	S2a5 and s2a6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime

This cliff-top maritime community is characterised by a closed, tight sward dominated by an abundance of sea plantain and stag's-horn plantain with ribwort plantain and stolons of creeping bent sporadically through the sward. Red fescue can be prominent and unusually cock's-foot was a community constant in these expressions, present at very low abundance. Characteristically there is much bare ground. In one expression there was evidence of therophytes although these were not identifiable at the time of survey.

Locally in more exposed locations thrift is frequent, suggesting most affinity with the Armeria maritima sub-community although other preferential species were not recorded. Where the exposed locations where this community thrives are used by roosting birds, sea mayweed and spear-leaved orache were recorded responding to both the eutrophication and dispersal of seed or vegetative propagules on the birds. In these situations there was also an increase in abundance of red fescue (e.g. quadrat 4).

In the absence of grazing the limited expressions on south facing aspect of the coast from Flamborough Head to Sewerby are maintained on extremely exposed lenses of freely draining soils (e.g. TN35). On Flamborough Head short turf is maintained through trampling and extreme maritime exposure (for example at TN19).

Table 33 – The following species were recorded in MC10a.

Species	DAFOR
Plantago lanceolata	F
Plantago coronopus	F / LA
Plantago maritima	F / LD
Armeria maritima	LF
Trichostomum brachydontium	LF
Agrostis stolonifera	O
Bellis perennis	O
Carlina vulgaris	O
Dactylis glomerata	O
Festuca rubra	O
Sonchus asper	O
Achillea millefolium	R
Atriplex prostata	R
Centaurea nigra	R
Cerastium diffusum	R
Danthonia decumbens	R
Galium verum	R

Species	DAFOR
Jacobaea vulgaris	R
Lotus corniculatus	R
Schedonorus arundinaceus	R
Scorzoneroides autumnalis	R
Trifolium pratense	R
Trifolium pratense	R
Tripleurospermum maritimum	R

Table 34 – The following quadrat data was recorded for MC10a, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Quadrat location - OS Grid TA	**2106 6897**	**2355 6918**	**2577 7043**	**2465 7195**	**2301 7245**		
Sward height (cm)	**5**	**8**	**5**	**4**	**4**		
Bare ground (%)	**75**	**20**	**20**	**25**	**20**		
Plantago coronopus	6	4	2	6	8	V	(2-8)
Plantago maritima	5	6	8	5		IV	(5-8)
Plantago lanceolata	3	4	3		2	IV	(2-4)
Dactylis glomerata	2	3		1	1	IV	(1-3)
Sonchus asper	3	2	2			III	(2-3)
Festuca rubra	2		2	5		III	(2-5)
Trichostomum brachydontium	3	4				II	(3-4)
Armeria maritima				2	2	II	(2_)
Agrostis stolonifera			3	2		II	(2-3
Tripleurospermum maritimum				1	3	II	(1-3)
Danthonia decumbens		4				I	(4_)
Galium verum		3				I	(3_)
Achillea millefolium		3				I	(3_)
Jacobaea vulgaris			3			I	(3_)

Species	Q1	Q2	Q3	Q4	Q5	Freq	Abundance
Scorzoneroides autumnalis			3			I	(3_)
Atriplex prostata				2		I	(2_)
Cerastium diffusum					2	I	(2_)
Lotus corniculatus			1			I	(1_)
Centaurea nigra		1				I	(1_)
Carlina vulgaris		1				I	(1_)
Schedonorus arundinaceus			1			I	(1_)
Trifolium pratense			1			I	(1_)

MC11c *Festuca rubra – Daucus carota* ssp gummifer maritime grassland; *Sanguisorba* minor sub-community

Table 35 – MC11c Community Attributes

Attribute	NVC Code – MC11c
Broad habitat type	Supralittoral Rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime Cliff and Slope
UKHabs code	S2a5 and s2a6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime

Community constants red fescue, cock's-foot and wild carrot are present; however, the latter is not ssp. gummifer. The frequency of these species gives the vegetation a characteristic physiognomy with a tussocky sward dominated by grasses with flowering heads of wild carrot floating above. Salad burnet, ribwort plantain, small scabious, lady's-bedstraw and bird's-foot trefoil are preferential suggesting most affinity with the Sanguisorba minor sub-community.

Notably in the survey area this community supports an abundance of false brome in the sward further adding to the tussocky nature of the community. False brome is not mentioned in the NVC description for MC11, however, tor-grass can be abundant in MC11c and it may be fulfilling this niche in the community. This was suggested by Milliken and Pendry (2002) who described this vegetation in terms of a community they defined as BS** Brachypodium-rich cliff grassland. Whilst this is a valid choice, the affinity to MC11 in

other respects is clear and the current study is content to describe in terms of published text for MC11c.

The community was recorded in sheltered often south-facing locations on thin, base-rich soils over chalk. Maritime influence from salt spray is low, however, exposure to sun and wind clearly have an impact on the floristics and community structure. The community was recorded from Dane's Dyke (south) to the east, becoming increasingly prevalent on the cliffs around South Landing and forming the dominant maritime vegetation east to the lighthouse at Flamborough Head. Expressions on the north facing aspect of the headland are much more limited being restricted to sheltered, south-facing aspects on cliff features such as Breil Nook and Thornwick Bay. The location of this community on exposed cliff tops and steep friable slopes hampered access to the community for close inspection.

The open, south-facing aspect and patches of bare ground make this an important community for thermophilous invertebrates and Orthoptera were recorded during the current survey (TN44). Further invertebrate study in this maritime community is recommended.

Table 36 – The following species were recorded in MC11c.

Species	DAFOR
Brachypodium sylvaticum	A / LD
Daucus carota	F / LA
Festuca rubra	F / LA
Agrostis stolonifera	F
Centaurea nigra	F
Dactylis glomerata	F
Plantago lanceolata	F
Anthyllis vulneraria	LF
Plantago maritima	LF
Potentilla reptans	LF
Sanguisorba minor	LF
Carex flacca	LF
Carlina vulgaris	O / LF
Brachythecium rutabulum	O
Campanula rotundifolia	O
Centaurea scabiosa	O
Galium verum	O

Species	DAFOR
Hypochaeris radicata	O
Jacobaea vulgaris	O
Leontodon hispidus	O
Lotus corniculatus	O
Ononis repens	O
Pilosella officinarum	O
Rubus fruticosus agg	O
Trichostomum brachydontium	O
Trisetum flavescens	O
Knautia arvensis	O
Medicago lupulina	O
Trifolium campestre	R
Achillea millefolium	R
Arrhenatherum elatius	R
Bryum capillare	R
Lepidium draba	R
Cirsium arvense	R
Cirsium vulgare	R
Schedonorus arundinaceus	R
Heracleum sphondylium	R
Lathyrus pratensis	R
Scorzoneroides autumnalis	R
Sonchus asper	R
Jacobaea erucifolius	R

Table 37 – The following quadrat data was recorded in MC11c, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Frequency	Abundance
Quadrat location - OS Grid TA	**2173 6923**	**2211 6921**	**2415 6937**	**2542 7096**		
Sward height	**25**	**20**	**30**	**20**		
Bare ground	**4**	**20**	**4**	**3**		
Brachypodium sylvaticum	7	7	8	9	V	(7-9)
Festuca rubra	3	5	3	4	V	(3-5)
Plantago lanceolata	4	2	3	4	V	(2-4)
Daucus carota	4	2	5	4	V	(2-5)
Dactylis glomerata	4	2	3	2	V	(2-4)
Centaurea nigra	4	3	4	2	V	(2-4)
Jacobaea vulgaris	2	2	1	3	V	(1-3)
Agrostis stolonifera	3			3	III	(3_)
Potentilla reptans			3	3	III	(3_)
Brachythecium rutabulum	3			3	III	(3_)
Trichostomum brachydontium	3	3			III	(3_)
Campanula rotundifolia		3		3	III	(3_)
Ononis repens	2			2	III	(2_)
Carlina vulgaris	2	2			III	(2_)
Lathyrus pratensis	2			3	III	(2-3)
Pilosella officinarum	2	2			III	(2_)
Lotus corniculatus	3	2			III	(2-3)
Arrhenatherum elatius			3	2	III	(2-3)
Centaurea scabiosa		2		1	III	(1-2)
Trisetum flavescens	4				II	(4_)
Schedonorus arundinaceus	4				II	(4_)
Sanguisorba minor				4	II	(4_)
Galium verum	3				II	(3_)
Rubus fruticosus agg	2				II	(2_)
Bryum capillare				2	II	(2_)
Sonchus asper	1				II	(1_)

Species	Q1	Q2	Q3	Q4	Frequency	Abundance
Scorzoneroides autumnalis		1			II	(1_)
Heracleum spondylium			1		II	(1_)
Cirsium vulgare			1		II	(1_)
Cirsium arvense				1	II	(1_)

MG1a *Arrhenatherum-elatius* grassland; *Festuca rubra* sub-community

Table 38 – MG1a Community Attributes

Attribute	NVC code – MG1a
Broad habitat type	Neutral Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	g3c5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Supporting habitat / May form an element
Status	Para-maritime

This community is dominated by coarse grasses including false oat-grass and cock's foot and hogweed is also a community constant. Yorkshire fog is locally frequent and red fescue may be prominent. Overall, the combination of species is consistent with the description for MG1a in Rodwell 1992.

The community develops throughout the site on the fertile, moisture retentive clay soils, predominantly on the cliff top where maritime influence is minimal. MG1a also occurs sporadically in sheltered locations where spray deposition is limited on soft cliff slope.

There is evidence of eutrophication in localised areas both where arable land is immediately adjacent to the cliff top (likely as a result of fertiliser drift and nutrient rich run-off e.g. at TN33) and where there is updraft from seabird nesting cliffs. In both cases this leads to an increase in the nutrient status of soil. Curiously, where eutrophication occurs adjacent to intensively managed farmland the usual preferential species are frequent, namely common nettle and creeping thistle. However, where eutrophication is due to seabird colonies there is an abundance of red campion in the sward, a species not recorded for MG1 in Rodwell (1992). It may be that the seabird enriched grassland is a MG1 sub-community still to be described as a number of species are preferential including cock's-foot, common couch, common nettle, creeping thistle and hogweed. In both cases further study to elucidate pathways for sources of eutrophication is necessary if inputs are to be managed. One other site of eutrophication was noted where grass clippings are deposited on the cliff top adjacent to Sewerby Cricket Club (TN38).

Stands of MG1 on the coast tend to be unmanaged, with neither grazing nor cutting, and a tussocky sward usually develops. Where habitation occurs nearby MG1 grassland on the cliff is often subject to tipping of garden waste and invasive non-native species such as Montbretia can become established (e.g. TN14, TN15, TN17, TN18).

Scattered scrub occasionally accompanies MG1a and can be viewed as early succession to continuous scrub and ultimately woodland.

Whilst MG1a grassland occurs throughout the survey area where conditions are favourable, there are particular areas where the community is extensive. These areas can be associated with a nutrient source, however, as stated above further work is needed to establish source and pathway for nutrient rich vectors.

There is a notable large extent of MG1a associated with the golf course to the west of Danes Dyke (south), abandoned farmland at Flamborough Head and on former farmland at High Holme between Thornwick Bay and North Landing. MG1a is well developed all along the bird nesting cliffs from Danes Dyke (north) west to Bartlett Nab and continues as a broad band inland from the cliff top to Buckton Cliff. There are also considerable expressions above the soft cliffs at Speeton Cliff which appear to be arable reversion associated with exercise areas for the caravan park and awkward corners of the field south of Old Beck.

Table 39 – Species recorded in this community are listed below:

Species	DAFOR
Arrhenatherum elatius	D
Dactylis glomerata	F
Festuca rubra	F
Elymus repens	LF
Urtica dioica	LF
Pulicaria dysenterica	LF
Centaurea scabiosa	LF
Silene dioica	O / LA
Centaurea nigra	O / LF
Cirsium arvense	O / LF
Heracleum sphondylium	O / LF
Plantago lanceolata	O / LF
Rubus fruticosus agg	O / LF
Rumex obtusifolius	O / LF
Achillea millefolium	O

Species	DAFOR
Agrostis stolonifera	O
Calystegia sepium	O
Cirsium vulgare	O
Convolvulus arvensis	O
Galium aparine	O
Holcus lanatus	O
Lathyrus pratensis	O
Malva sylvestris	O
Potentilla reptans	O
Rumex acetosa	O
Tragopogon pratensis	O
Trifolium repens	O
Anthriscus sylvestris	O
Scorzoneroides autumnalis	O
Angelica sylvestris	O
Knautia arvensis	R
Daucus carota	R
Equisetum arvense	R
Schedonorus arundinaceus	R
Galium verum	R
Lolium perenne	R
Sonchus arvensis	R
Vicia cracca	R
Silene latifolia subsp. Alba	R
Malva sylvestris	R
Torilis japonica	R
Schedonorus giganteus	R
Deschampsia cespitosa	R
Lotus pedunculatus	R
Agrimonia eupatoria	R

Table 40 – Quadrat data recorded in this community is detailed below, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Quadrat location – OS Grid TA	**2565 7026**	**2470 7168**	**2252 7257**	**2124 7329**	**1541 7535**		
Sward height (cm)	**35**	**35**	**40**	**50**	**60**		
Bare ground (%)	**0**	**0**	**0**	**0**	**0**		
Arrhenatherum elatius	8	8	9	8	8	V	(8-9)
Dactylis glomerata	4	4	4	6	6	V	(4-6)
Festuca rubra	5	4	5	3	3	V	(3-5)
Heracleum sphondylium		4	1	2	1	IV	(1-4)
Cirsium arvense			2	3	2	III	(2-3)
Elymus repens		5		4		II	(4-5)
Agrostis stolonifera	3		3			II	(3_)
Holcus lanatus	5				3	II	(3-5)
Silene dioica				4	3	II	(3-4)
Rumex acetosa	2				2	II	(2_)
Centaurea nigra			4			I	(4_)
Convolvulus arvensis	3					I	(3_)
Angelica sylvestris					3	I	(3_)
Potentilla reptans	3					I	(3_)
Plantago lanceolata		2				I	(2_)
Urtica dioica	2					I	(2_)
Achillea millefolium			2			I	(2_)

MG5b *Cynosurus cristatus – Centaurea nigra* grassland *Galium verum* sub-community

Table 41 – MG5b Community Attributes

Attribute	NVC Code – MG5b
Broad habitat type	Supralittoral rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime cliff and slope
UKHabs code	s2a
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Para-maritime / Sub-maritime

Community constants for MG5 are well represented with black knapweed, red fescue, cock's-foot and ribwort plantain, other community constants are represented by crested dog's-tail, Yorkshire fog and red clover. Due to the scarcity of this community and poor accessibility only two quadrats were possible.

Forbs are represented by the appearance of lady's bedstraw, yarrow, yellow-oat grass indicating influence of base-rich sub-soils and placing in the *Galium verum* sub-community (MG5b).

The community has a rather limited distribution and is present in limited stands on mesotrophic soils on the low chalk cliffs from Sewerby to Flamborough Head. On the north side of Flamborough Head the community is very scarce with limited expressions in sheltered spots on mesotrophic soils. There is an area of unimproved grassland at North Landing which was recorded as MG5b, however, at the time of the survey the grassland was heavily grazed and poached and access was not possible and so placing of this vegetation may need to be revised when access is possible.

The community was not recorded as part of the soft cliff resource at Speeton Sands where exposure is such that maritime grassland is supported, or soils are base-rich enough to support calcareous grassland. There is one rather species poor expression at Speeton which forms part of the caravan park extension.

Table 42 – The following species were recorded in MG5b grassland.

Species	DAFOR
Trifolium pratense	F
Dactylis glomerata	F
Achillea millefolium	LF
Cynosurus cristatus	LF
Galium verum	LF
Rhytidiadelphus squarrosus	LF
Agrostis capillaris	O / LF
Agrostis stolonifera	O
Anthoxanthum odoratum	O
Arrhenatherum elatius	O
Brachypodium sylvaticum	O
Brachythecium rutabulum	O
Calliergonella cuspidata	O
Cerastium fontanum	O
Cirsium arvense	O
Conopodium majus	O
Dactylorhiza sp	O
Jacobaea vulgaris	O
Potentilla reptans	O
Rumex acetosa	O
Scorzoneroides autumnalis	O
Taraxacum officinale agg.	O
Trisetum flavescens	O
Veronica chamaedrys	O
Hypochaeris radicata	O
Centaurea scabiosa	O
Campanula rotundifolia	O
Cirsium vulgare	R
Heracleum sphondylium	R
Knautia arvensis	R
Prunella vulgaris	R

Species	DAFOR
Rubus fruticosus agg.	R
Schedonorus arundinaceus	R
Trifolium repens	R
Vicia cracca	R
Vicia hirsuta	R
Phleum pratense subsp. bertolonii	R
Sanguisorba minor	R
Daucus carota	R
Erodium cicutarium	R

Table 43 – The following species were recorded in MG5b grassland quadrats, blank cells indicate species not found.

Species	Q1	Q2	Frequency	Abundance
Quadrat location - OS Grid TA	**2073 6883**	**2319 6932**		
Sward height (cm)	**24**	**28**		
Bare ground (%)	**0**	**0**		
Festuca rubra	8	6	V	(6-8)
Centaurea nigra	4	5	V	(4-5)
Plantago lanceolata	4	3	V	(3-4)
Galium verum	3	3	V	(3_)
Dactylis glomerata	2	1	V	(1-2)
Lathyrus pratensis	2	1	V	(1-2)
Cynosurus cristatus		7	III	(7_)
Agrostis capillaris		6	III	(6_)
Arrhenatherum elatius	4		III	(4_)
Holcus lanatus		4	III	(4_)
Trifolium pratense		3	III	(3_)
Anthoxanthum odoratum		3	III	(3_)
Achillea millefolium		2	III	(2_)
Trisetum flavescens		2	III	(2_)
Schedonorus arundinaceus	2		III	(2_)

Species	Q1	Q2	Frequency	Abundance
Vicia hirsuta	2		III	(2_)
Scorzoneroides autumnalis		2	III	(2_)
Conopodium majus		2	III	(2_)
Jacobaea vulgaris		1	III	(1_)
To here *Cirsium arvense*		1	III	(1_)

MG6a *Lolium perenne-Cynosurus cristatus* grassland; Typical sub community

Table 44 – MG6a Community Attributes

Attribute	NVC Code – MG6a
Broad habitat type	Neutral Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	g3c6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	No
Maritime Status	None

This is a species-poor improved grassland dominated by perennial rye-grass *Lolium perenne,* with the abundance of white clover Trifolium repens, and occurrence of ribwort plantain *Plantago lanceolata*, yarrow *Achillea millefolium*, creeping buttercup *Ranunculus repens* and daisy *Bellis perennis* at low cover, indicating that this grassland is best described as the Typical MG6 sub-community. *Timothy Phleum pratense* is prominent in some expressions. This grassland is maintained by agricultural management including application of fertiliser and use of herbicide.

Where this management has been relaxed the species composition of the grassland changes as perennial rye-grass loses vigour allowing other grasses to dominate and native forbs to establish. The evolution of the grassland is dependent on local seed source and edaphic factors. The latter, including maritime influence, is masked by the intensive management undertaken to maintain MG6 grassland.

There was evidence that a grassland buffer zone has been created at the top of Speeton Cliff using a wildflower seed mix (MG6a* on the map). Whilst dominated by perennial rye-grass the sward is more species rich with white clover Trifolium repens, ribwort plantain *Plantago lanceolata*, meadow vetchling *Lathyrus pratensis*, yellow rattle *Rhinanthus minor*,

black knapweed *Centaurea nigra*, red clover *Trifolium pratense*, ox-eye daisy *Leucanthemum vulgare* and autumn hawkbit *Scorzoneroides autumnalis*.

Amenity grassland at Sewerby was also considered to be within the locus of MG6a.

MG7 *Lolium perenne* leys

Table 45 – MG7 Community Attributes

Attribute	NVC Code – MG7
Broad habitat type	Modified Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	g4
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	No
Maritime Status	None

This improved grassland was recorded on intensively managed agricultural situations where fields have been recently ploughed and re-seeded with perennial rye-grass. Few other species are present in these stands which are regularly cut for silage throughout the growing season.

MG9b *Holcus lanatus – Deschampsia cespitosa* grassland *Arrhenatherum elatius* sub-community

Table 46 – MG9b Community Attributes

Attribute	NVC Code – MG9
Broad habitat type	Neutral Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	g3c5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Supporting habitat
Status	Para-maritime

One expression of this grassland dominated by tufted hair-grass was recorded in the survey area at Reighton Sands Holiday Park. Dominated by community constant tufted hair-grass and with occasional Yorkshire fog the grassland was considered a ‘good fit’ with

published description. False oat-grass and black knapweed are both frequent throughout and common sorrel occasional lending affinity with the *Arrhenatherum elatius* sub-community.

The sward is relatively species-rich with evidence of Dactylorhiza sp orchids and meadowsweet, however, there are significant stands of INNS garden escape such as Shasta daisy and Montbretia.

Table 47 – The following species were recorded in this community.

Species	DAFOR
Deschampsia cespitosa	D
Arrhenatherum elatius	F
Centaurea nigra	F
Cirsium arvense	F
Filipendula ulmaria	F
Juncus conglomeratus	LF
Pulicaria dysenterica	LF
Rumex obtusifolius	LF
Montbretia	LF
Leucanthemum × superbum	LF
Dactylorhiza sp	LF
Holcus lanatus	O
Jacobaea vulgaris	O
Rumex acetosa	O
Carex flacca	O
Rubus fruticosus agg	O
Angelica sylvestris	O
Dactylis glomerata	R
Potentilla anserina	R

MG10a *Holcus lanatus – Juncus effusus* rush-pasture Typical sub-community

Table 48 – MG10a Community Attributes.

Attribute	NVC Code – MG10a
Broad habitat type	Neutral Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	g3c8
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Para-maritime

The placing of grasslands on deep, water retentive circum-neutral soils dominated by Yorkshire fog is always problematic as the published NVC does not seem to acknowledge what is really quite a common grassland in northern England. In this case it is suggested that the community has most affinity with MG10 which is characterised by and abundance of Yorkshire fog, however, no soft rush was recorded. Compact rush is present in small amount.

The community was present in a relatively steep pasture which appears little grazed at present and is likely derived from acid grassland which occurs in the same field on steeper slopes and thinner soils. Whilst unimproved, the grassland is species poor but provides buffering to cliff vegetation from intensively managed arable land to the south.

Table 49 – The following species were recorded in this community.

Species	DAFOR
Holcus lanatus	D
Agrostis capillaris	A
Cirsium arvense	F
Heracleum sphondylium	F
Plantago lanceolata	F
Juncus conglomeratus	LF
Festuca rubra	O / LF
Arrhenatherum elatius	O / LF
Rumex acetosa	O
Centaurea nigra	O

Species	DAFOR
Deschampsia cespitosa	O
Dactylis glomerata	O
Anthoxanthum odoratum	O
Potentilla erecta	O
Cirsium palustre	O
Taraxacum officinale agg	R
Prunella vulgaris	R
Achillea millefolium	R
Cerastium fontanum	R
Jacobaea vulgaris	R
Cirsium vulgare	R

Table 50 – The following quadrat data was collected in this community, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Quadrat location - OS Grid TA	1579 7509	1589 7500	1588 7505	1583 7507	1562 7514		
Sward height (cm)	25	25	30	25	20		
Bare ground (%)	0	0	0	0	0		
Holcus lanatus	8	8	9	8	7	V	(3-4)
Agrostis capillaris	7	7	5	6	7	V	(4-8)
Cirsium arvense	2		2	3		III	(2_)
Heracleum sphondylium	1		2	2		III	(1_)
Plantago lanceolata	2			1	2	III	(2_)
Festuca rubra				4	3	II	(4_)
Arrhenatherum elatius				2	4	II	(2_)
Rumex acetosa	2		2			II	(2-3)
Centaurea nigra	2				2	II	(2_)
Deschampsia cespitosa	4					I	(2_)
Dactylis glomerata					4	I	(2_)

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Anthoxanthum odoratum	3					I	(3-5)
Potentilla erecta			2			I	(2-3)
Cirsium palustre	2					I	(2_)
Taraxacum officinale agg					2	I	(2_)
Prunella vulgaris					2	I	(2_)
Achillea millefolium					1	I	(1_)
Cerastium fontanum		1				I	(2_)
Jacobaea vulgaris			1			I	(2_)
Cirsium vulgare					1	I	(2_)

MG11b *Festuca rubra – Agrostis stolonifera – Potentilla anserina* grassland, *Atriplex prostrata* sub-community

Table 51 – MG11b Community Attributes.

Attribute	NVC Code – MG11b
Broad habitat type	Neutral Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	g3c6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime / Para-maritime / Sub-maritime

The community present on eroding cliffs of this survey area has affinities with MG11 as described in Rodwell (1992), however, whilst the floristics are similar, the habitat is quite different. MG11 generally forms on areas of poorly vegetated mud, inundated occasionally by brackish water. Here the community is forming on bare mud, and the maritime influence is variable dependent on exposure to salt spray rather than direct inundation.

Although invariably present, red fescue is less abundant in MG11 on this site than the description in Rodwell suggests, which is likely due to the derivation of the community reflecting the instability of the substrate. The community present is considered to have most affinity with MG11b *Atriplex prostrata* sub-community, however, maritime species are not usually prominent.

At a distance, areas supporting this community can look like bare ground. On closer inspection a thinly distributed grassland community is apparent, with creeping bent straggling across the surface colonising bare ground. The other community constant is colt's-foot which can be abundant in some stands, both species colonising vegetatively.

MG11 is widespread throughout the site where soft cliffs occur, particularly where active erosion is taking place exposing large areas of bare soil and subsoil. Thus, at North Sands, Sewerby soft cliff occurs supporting much MG11, as does soft cliff at Speeton Sands.

Chalk cliffs on the south side of Flamborough Headland are relatively low and have substantial load of boulder clay leading to the formation of perched soft cliff which supports MG11. Expressions on perched soft cliff at Sewerby receive little maritime influence and creeping cinquefoil and common poppy are present. Expressions on perched soft cliff occurs with limited MG11 patches between Flamborough Head and Thornwick Bay. West of Thornwick Bay the chalk cliffs are high with less overburden and MG11 is scarce as erosion is sporadic.

Where MG11 occurs on perched soft cliff over chalk an number of calcicoles are preferential including small scabious, wild carrot and bird's-foot trefoil. Interestingly this community also provides a locus for ribwort, buck's-horn and sea plantain suggesting the potential to develop into MC10a over time.

A feature of perched soft cliff on chalk at Sewerby is the tendency for clay soils to deposit over the cliff to form large mounds at the base of the cliff (on the beach). Whilst rapidly eroded away, vegetation conforming to MG11 continues to persist and depending on season and weather may persist for a number of years.

In more exposed expressions yellow-wort and sea mayweed were noted to be preferential, and at Reighton Gap kidney vetch is preferential in MG11, perhaps due to the abundant seed source close at hand.

Table 52 – The following species were recorded in MG11b.

Species	DAFOR	NOTES
Agrostis stolonifera	F	
Sonchus asper	F	
Tussilago farfara	F	
Plantago maritima	LF	F / LA where chalk is the substrate
Centaurea scabiosa	LF	Where chalk is the substrate
Pulicaria dysenterica	O / LF	
Anthyllis vulneraria	O	LF at Reighton Gap

Species	DAFOR	NOTES
Carex flacca	O	
Centaurea nigra	O	
Cirsium arvense	O	
Dactylis glomerata	O	
Daucus carota	O	Where chalk is the substrate
Festuca rubra	O	
Jacobaea vulgaris	O	
Lotus corniculatus	O	Where chalk is the substrate
Plantago coronopus	O	F where chalk is the substrate
Plantago lanceolata	O	F where chalk is the substrate
Potentilla reptans	O	
Trichostomum crispulum	O	
Tripleurospermum maritimum	O	In more exposed expressions
Blackstonia perfoliata	O	In more exposed expressions
Sonchus arvensis	O	
Armeria maritima	R	
Centaurium erythraea	R	
Cochlearia officinalis	R	
Dipsacus fullonum	R	
Elymus repens	R	
Epilobium hirsutum	R	
Equisetum arvense	R	
Heracleum spondylium	R	
Holcus lanatus	R	
Lathyrus pratensis	R	
Leontodon hispidus	R	
Medicago lupulina	R	
Rubus fruticosus agg	R	

Species	DAFOR	NOTES
Rumex obtusifolius	R	
Trifolium pratense	R	
Picris echioides	R	
Papaver rhoeas	R	
Melilotus altissimus	R	
Jacobaea erucifolius	R	

Table 53 – The following quadrat data was recorded for MG11b, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Quadrat location - OS Grid TA	**1967 6827**	**1983 6845**	**2559 7073**	**1474 7584**	**2330 7222**		
Sward height	**10**	**14**	**12**	**10**	**8**		
Bare ground	**90**	**85**	**55**	**70**	**90**		
Agrostis stolonifera	4	5	4	6	5	V	(4-6)
Tussilago farfara	4	3	4	5	5	V	(3-5)
Festuca rubra	1		4		4	III	(1-4)
Plantago lanceolata		4	2		1	III	(1-4)
Sonchus asper		1	1		3	III	(1-3)
Dactylis glomerata	2		2		1	III	(1-2)
Plantago maritima			3		2	II	(2-3)
Pulicaria dysenterica		1		3		II	(1-3)
Medicago lupulina	3					I	(3_)
Cirsium arvense	2					I	(2_)
Holcus lanatus	2					I	(2_)
Lotus corniculatus			2			I	(2_)
Carex flacca				2		I	(2_)
Lathyrus pratensis				2		I	(2_)
Plantago coronopus			1			I	(1_)
Rubus fruticosus agg	1					I	(1_)
Dipsacus fullonum	1					I	(1_)
Rumex obtusifolius		1				I	(1_)

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Epilobium hirsutum		1				I	(1_)
Heracleum spondylium			1			I	(1_)
Trifolium pratense					1	I	(1_)
Centaurea nigra					1	I	(1_)

MG12a – *Festuca arundinacea* grassland *Lolium perenne – Holcus lanatus* sub-community

Table 54 – MG12a Community Attributes

Attribute	NVC Code – MG12a
Broad habitat type	Neutral Grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	g3c8
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Para-maritime

This para-maritime grassland community develops on moist but free-draining soils on coastal soft cliffs, and is characteristic of the Yorkshire coast. In the survey area the community is dominated by tussocks of tall fescue with creeping bent and red fescue, the three community constants for MG12. Forbs are represented by ribwort plantain, spear thistle, colt's-foot, common ragwort and bramble. This combination of associates is consistent with MG12a *Lolium perenne – Holcus lanatus* sub-community, although there is clearly some elements associated with coastal communities of the east coast (colt's-foot and common fleabane).

The community was encountered sporadically on soft cliffs and perched soft cliff at Sewerby with larger areas recorded on south west facing slopes at Dane's Dyke (south) and South Landing. The community forms relatively stable stands on steep slopes on the perched soft cliff where there can be much bare ground allowing kidney vetch, sea plantain, black knapweed and ribwort plantain to thrive between the tall fescue tussocks (e.g. TN41).

Small pockets of MG12a exist on the perched soft cliff around Flamborough Head, although these are largely inaccessible. Limited stands also occur at North Landing and Thornwick Bay, but the community is generally scarce on the north facing aspect of Flamborough Headland (Bempton Cliffs, Buckton Cliffs and Speeton Cliff). A few patches

occur on soft cliff at Speeton Sands, but the community is generally poorly developed here.

On stabilised soft cliff, tall fescue can become prominent in a wide range of soil moisture conditions, typically where erosion cracks appear in dry grassland tall fescue colonises the cracks which represent pockets of moist, bare ground and the tussocks become dominant over time. Alternatively, tall fescue colonises flushed areas of thinly vegetated soft cliff after erosion events. Consequently, MG12 may feature dry grassland species and species of early succession flushes.

The situation is further complicated by the onset of incremental erosion in once MG12b is established which opens up cracks where conditions suitable for further colonising species (including INNS) and species of humid sheltered spots including small liverworts. Overall this grassland can represent a species-rich element of the soft cliff flora, notably at South Landing and soft cliff at Sewerby.

Table 55 – The following species were recorded in MG12a.

Species	DAFOR
Schedonorus arundinaceus	D
Agrostis stolonifera	F
Festuca rubra	F
Holcus lanatus	F
Brachypodium sylvaticum	LF
Brachythecium rutabulum	LF
Calliergonella cuspidata	LF
Pulicaria dysenterica	LF
Rubus fruticosus	LF
Tussilago farfara	LF
Plantago maritima	vLF
Anthyllis vulneraria	vLF
Achillea millefolium	O
Centaurea nigra	O
Cirsium palustre	O
Cirsium vulgare	O
Convolvulus arvensis	O
Dactylis glomerata	O
Epilobium hirsutum	O

Species	DAFOR
Equisetum arvense	O
Heracleum sphondylium	O
Jacobaea vulgaris	O
Juncus inflexus	O
Lathyrus pratensis	O
Parnassia palustris	O
Plantago lanceolata	O
Potentilla reptans	O
Sonchus asper	O
Hypochaeris radicata	O
Angelica sylvestris	R
Arrhenatherum elatius	R
Carex flacca	R
Cirsium arvense	R
Daucus carota	R
Galium aparine	R
Juncus conglomeratus	R
Leontodon hispidus	R
Melilotus altissimus	R
Prunella vulgaris	R
Scorzoneroides autumnalis	R
Taraxacum officinale agg	R
Trifolium pratense	R
Veronica chamaedrys	R

Table 56 – The following quadrat data was collected for MG12a, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Frequency	Abundance
Quadrat location - OS Grid TA	**2015 6869**	**2334 6918**	**1436 7612**		
Sward height (cm)	**40**	**50**	**70**		
Bare ground (%)	**3**	**2**	**45**		

Species	Q1	Q2	Q3	Frequency	Abundance
Schedonorus arundinaceus	8	9	7	V	(7-9)
Agrostis stolonifera	5	4	5	V	(4-5)
Festuca rubra		4	3	IV	(3-4)
Plantago lanceolata	3	3		IV	(3_)
Jacobaea vulgaris		2	2	IV	(2_)
Tussilago farfara	1		4	IV	(1-4)
Rubus fruticosus agg	1	2		IV	(1-2)
Cirsium vulgare	1	1		IV	(1_)
Holcus lanatus			4	II	(4_)
Lathyrus pratensis	4			II	(4_)
Potentilla reptans		3		II	(3_)
Achillea millefolium	3			II	(3_)
Calliergonella cuspidata	3			II	(3_)
Brachythecium rutabulum	3			II	(3_)
Dactylis glomerata		3		II	(3_)
Brachypodium sylvaticum		3		II	(3_)
Convolvulus arvensis	2			II	(2_)
Taraxacum officinale agg	2			II	(2_)
Veronica chamaedrys	2			II	(2_)
Trifolium pratense	2			II	(2_)
Scorzoneroides autumnalis	2			II	(2_)
Pulicaria dysenterica			2	II	(2_)
Leontodon hispidus			2	II	(2_)
Centaurea nigra		1		II	(1_)
Galium aparine		1		II	(1_)
Heracleum sphondylium	1			II	(1_)
Cirsium palustre	1			II	(1_)

S4b *Phragmites australis* reedbed *Galium palustre* sub-community

Table 57 – S4b Community Attributes

Attribute	NVC code – S4b
Broad habitat type	Fen Marsh and Swamp
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Fen
UKHabs code	f2a
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime and Para-maritime

S4 swamp is dominated by common reed and occurs in flushed zones and wetland throughout the survey area. On soft cliff, a degree of stability is necessary to allow common reed to develop a sward, however, once established the rhizomes serve to reduce erosion and allow the plant to spread. It is likely that the S4 between Dane's Dyke (south) and South Landing on perched soft cliff is maintained by seepage from inland.

Limited expressions occur at North Landing, however, there are two extensive reedbeds at Thornwick Bay; one appears planted and was not accessed, the other has formed on the flushed slope of a narrow valley. In addition, there is one area of S4 on the soft cliffs above Speeton Sands.

These expressions are in sheltered locations and maritime influence appears low with forbs represented by water mint and great willowherb and eutrophication apparent indicated by the abundance of creeping thistle and common nettle.

Table 58 – The following species were recorded in S4b.

Species	DAFOR
Phragmites australis	D
Cirsium arvense	F
Urtica dioica	F / LA
Pulicaria dysenterica	LA
Arrhenatherum elatius	LF
Silene dioica	LF
Rubus fruticosus agg	LF
Angelica sylvestris	LF
Calystegia sepium	LF

Species	DAFOR
Primula vulgaris	O
Agrostis stolonifera	O
Epilobium hirsutum	O
Cirsium palustre	O
Dactylis glomerata	O
Kindbergia praelonga	O
Eupatorium cannabinum	O
Lathyrus pratensis	O
Eurhynchium striatum	O
Rumex acetosa	O
Mentha aquatica	O
Schedonorus arundinaceus	O
Plantago lanceolata	R
Brachypodium sylvaticum	R
Dryopteris dilatata	R
Juncus conglomeratus	R
Heracleum sphondylium	R
Dryopteris filix-mas	R
Jacobaea vulgaris	R

Table 59 – The following quadrat data was collected in S4b, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Frequency	Abundance
Quadrat location – OS Grid TA	2182 6921	1503 7560	2313 7220	2312 7227		
Sward height (cm)	140	120	160	140		
Bare ground (%)	0	2	0	0		
Phragmites australis	10	10	10	10	V	(10_)
Urtica dioica	5		3	4	IV	(3-5)
Cirsium arvense	2			2	III	(2_)
Arrhenatherum elatius	4				II	(4_)
Epilobium hirsutum			2	3	II	(2-3)

Species	Q1	Q2	Q3	Q4	Frequency	Abundance
Primula vulgaris		2			II	(2_)
Agrostis stolonifera	2				II	(2_)
Pulicaria dysenterica		5			I	(5_)
Silene dioica				5	I	(5_)
Rubus fruticosus agg		5			I	(5_)
Angelica sylvestris		4			I	(4_)
Calystegia sepium			3		I	(3_)
Cirsium palustre		3			I	(3_)
Dactylis glomerata				3	I	(3_)
Kindbergia praelonga		3			I	(3_)
Lathyrus pratensis		3			I	(3_)
Eurhynchium striatum		3			I	(3_)
Mentha aquatica				2	I	(2_)
Plantago lanceolata		2			I	(2_)
Brachypodium sylvaticum	2				I	(2_)
Dryopteris dilatata					I	(2_)
Juncus conglomeratus		2			I	(2_)
Heracleum sphondylium	1				I	(1_)
Dryopteris filix-mas		1			I	(1_)

S4diii *Phragmites australis* reedbed *Atriplex prostrata* sub-community *Agrostis stolonifera* variant

Table 60 – S4diii Community Attributes

Attribute	NVC code – S4diii
Broad habitat type	Fen Marsh and Swamp
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Fen
UKHabs code	f2a
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime

Dominated by common reed, S4diii swamp was recorded in a flushed area on perched soft cliff on Flamborough Head. As is typical in these situations, common reed is short in stature and forms an open sward. A ground layer with creeping bent and red fescue is present, with occasional halophytes - common scurvy-grass and spear-leaved orache. The presence of these associates indicate most affinity with S4diii *Atriplex prostrata* sub-community Agrostis stolonifera variant.

There is evidence of eutrophication, likely from field drains, evidenced by the appearance of common nettle and creeping thistle.

Only one accessible expression of this community was encountered and the results are detailed in the table below.

Table 61 – Quadrat data for S4diii

Species	Q1	Frequency	Abundance
Quadrat location - OS Grid TA	2421 7206		
Sward height (cm)	110		
Bare ground (%)	0		
Phragmites australis	10	V	(10_)
Urtica dioica	4	V	(4_)
Primula vulgaris	4	V	(4_)
Arrhenatherum elatius	3	V	(3_)
Agrostis stolonifera	3	V	(3_)
Festuca rubra	3	V	(3_)
Rumex acetosa	3	V	(3_)
Cirsium arvense	2	V	(2_)
Dryopteris dilatata	2	V	(2_)
Cochlearia officinalis	2	V	(2_)
Atriplex prostrata	1	V	(1_)

S12b *Typha latifolia* swamp *Mentha aquatica* sub-community

Table 62 – S12b Community Attributes

Attribute	NVC code – S12b
Broad habitat type	Fen Marsh and Swamp
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Fen
UKHabs code	f2a
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

Where major slumps have taken place on soft cliff, water often accumulates behind ridges created by rotational slippage (a good example occurs at TN13). These perched wetlands are then rapidly colonised by wetland species with high dispersal capabilities (wind borne seed). These wetland communities persist until wet woodland forms or the sea erodes the feature before succession can take place (e.g. TN11).

Common reedmace can become dominant, however, stands of this community were very limited being recorded in small amount on soft cliff above Speeton Sands.

S14 *Sparganium erectum* swamp

Table 63 – S14 Community Attributes

Attribute	NVC code – S14
Broad habitat type	Fen Marsh and Swamp
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Fen
UKHabs code	f2a
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

Associated with wetlands on the soft cliffs above Speeton Sands, this community was encountered on a number of occasions.

Where branched bur-reed has colonised newly formed ponds on the clayey cliffs it forms marginal vegetation associated with other good colonisers such as marsh arrow-grass, jointed rush, creeping bent and glaucous sedge (e.g. at TN6). As wetlands mature S14

persists with branched bur-reed forming significant beds alongside patches of other wetland dominants, notable common spike-rush (e.g. at TN5).

This is another dynamic wetland community of soft cliffs at Speeton Sands where the constantly changing topography and hydrology creates opportunity for short-lived wetlands dominated by the species which colonises most rapidly. This can be due to both the intrinsic dispersal powers of wetland plants and serendipity.

S19 *Eleocharis palustris* swamp

Table 64 – S19 Community Attributes

Attribute	NVC code – S19
Broad habitat type	Fen Marsh and Swamp
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland Fen
UKHabs code	f2a
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

A number of wetlands support rafts of common spike-rush which can become overwhelmingly dominant. Examples of S19 were encountered as part of the dynamic wetland habitats of soft cliffs above Speeton Sands with mature examples at TN5 and TN7, and an early succession examples featuring common spike-rush with silverweed *Potentilla anserina* and creeping bent.

SD2 *Honkenya peploides – Cakile maritima* strandline community

Table 65 – SD2 Community Attributes

Attribute	NVC code – SD2
Broad habitat type	Supralittoral sediment
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Coastal vegetated shingle
UKHabs code	s3b
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Supporting habitat
Status	Maritime

The strand-line community, SD2 is represented on North Sands where the sea does not routinely wash the bottom of the cliff. The community is a loose association of species on the strandline characterised by Babington's orache *Atriplex glabriuscula*, silverweed *Potentilla anserina*, sea mayweed *Tripleurospermum maritimum* and occasionally prickly saltwort *Kali turgidum*. In some expressions of this strandline community there was an abundance of tomato plants, presumably the seed transmitted via the sewerage system.

The community was also recorded on the beach at South Landing represented by sea mayweed and Babington's orache.

SD5 *Leymus arenarius* mobile dune community

Table 66 – SD2 Community Attributes

Attribute	NVC code – SD5
Broad habitat type	Supralittoral sediment
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Coastal sand dunes
UKHabs code	s3a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Supporting habitat
Status	Maritime

One patch of lyme-grass has become established within the survey area on North Sands above high water mark which if undisturbed will start to form a dune system. There are further limited expressions associated with the steps up the cliff (TN43).

This species has a northerly distribution and is characteristic of dune systems in Northumberland and Scotland.

SM16 *Festuca rubra* salt-marsh community

Table 67 – SM16 Community Attributes

Attribute	NVC code – SM16
Broad habitat type	Littoral sediment
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Coastal saltmarsh
UKHabs code	t2a

Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Maritime

A small number of perched saltmarshes were encountered where red fescue is present with a range of plants typical of saltmarsh communities. A well developed example was recorded on the exposed perched soft cliff north of High Holme at Thornwick Bay (TN8) where sea spray was observed funnelling up the cliff on the breeze and depositing at the time of the survey. The community at TN8 features sea milkwort Lysimachia maritima, sea arrow-grass Triglochin maritima, saltmarsh rush Juncus gerardii and tawny sedge Carex hostiana.

Further, less species-rich examples were recorded at TN3 and TN4 where sea milkwort thrives with red fescue.

SM28 *Elymus repens* salt-marsh community

Table 68 – SM28 Community Attributes

Attribute	NVC code – SM16
Broad habitat type	Littoral sediment
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Coastal saltmarsh
UKHabs code	t2a
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Supporting habitat
Status	Maritime

This community was represented in the survey area at South Landing where an abundance of sea couch occurs above the strandline forming limited expressions of SM28 saltmarsh.

OV25 *Urtica dioica – Cirsium arvense* community, OV26 *Epilobium hirsutum* community and OV27 *Chamerion angustifolium* community

Table 69 – OV25 Community Attributes

Attribute	NVC code – OV25b
Broad habitat type	Modified grassland

UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	G4, Secondary code: 16
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	May be supporting habitat
Status	Para-maritime

Table 70 – OV26 Community Attributes

Attribute	NVC code – OV26
Broad habitat type	Fen, Marsh and Swamp
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	F2, Secondary code: 17
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

Table 71 – OV27 Community Attributes

Attribute	NVC code – OV27
Broad habitat type	Modified grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	G4, Secondary code: 16
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	May be supporting habitat
Status	Para-maritime

Dominated by great willowherb, OV26 forms where moist but well-aerated soils occur in the soft cliff matrix and on watercourses. Stands on the soft cliff and flushes on the top of the hard cliffs are usually on a slight slope or in areas that accumulate freshwater run-off. The community is extensive on soft cliff at North Sands, Sewerby and occurs sporadically on the perched soft cliff between Sewerby and South Landing. Sheltered valleys at North Landing and Thornwick Bay support areas of OV26, however, further expressions are scarce even on soft cliff at Speeton Sands.

The expressions of OV26 were found to be relatively species rich and on the soft cliff have a sub-maritime feel with the occurrence of common fleabane and colt's-foot. OV26 can form one of the seral stages for wetlands on soft cliff representing wetlands which have been stable for sometime allowing growth of great willowherb which out competes smaller, less vigorous species. In such cases characteristic bryophytes of M10 communities such as fern-leaved hook-moss and endive pellia persist under the great willowherb canopy.

At Dane's Dyke (south) an area of OV26 occurs associated with the stream where hemp agrimony *Eupatorium cannabinum* is co-dominant.

Common nettle is usually overwhelmingly dominant in OV25 which has a restricted distribution in the study area occurring only in fertile, well-drained soils on the cliff top where eutrophication has occurred. Associates include creeping thistle, common couch, false oat-grass, bramble, tall fescue and goosegrass.

Rose-bay willowherb characterises OV27 and formed limited stands as part of the matrix of communities on drier substrates in the soft cliff above Speeton Sands.

Table 72 – The following species were recorded in OV26;

Species	DAFOR
Epilobium hirsutum	D
Agrostis stolonifera	F
Urtica dioica	F
Rubus fruticosus	F
Tussilago farfara	F
Equisetum telmateia	LA
Juncus articulatus	LA
Pulicaria dysenterica	LF
Silene dioica	LF
Cratoneuron filicinum	LF
Galium aparine	LF
Carex hirta	LF
Eupatorium cannabinum	vLF
Holcus lanatus	O
Dactylis glomerata	O
Arrhenatherum elatius	O
Festuca rubra	O
Scrophularia nodosa	O

Species	DAFOR
Kindbergia praelonga	O
Pellia endiviifolia	O
Mentha aquatica	O
Cirsium arvense	O
Lathyrus pratensis	O
Vicia cracca	O
Calystegia sepium	O
Cirsium palustre	O
Heracleum sphondylium	R
Plantago lanceolata	R
Angelica sylvestris	R
Dipsacus fullonum	R
Jacobaea vulgaris	R

Table 73 – The following quadrat data was recorded for OV26, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Quadrat location - OS Grid TA	1962 6822	1985 6846	2533 7095	1541 7541	2337 7211		
Sward height (cm)	190	90	120	130	140		
Bare ground (%)	0	15	0	5	4		
Epilobium hirsutum	7	8	8	10	9	V	(2_)
Agrostis stolonifera		4	3	3		III	(2-3)
Urtica dioica			2	3	5	III	(2_)
Rubus fruticosus	1		2	3		III	(2_)
Equisetum telmateia	9	7				II	(2_)
Pulicaria dysenterica			6	3		II	(2-7)
Tussilago farfara		4		3		II	(3_)
Silene dioica				3	4	II	(2_)
Holcus lanatus		2	2			II	(1-4)
Dactylis glomerata				2	2	II	(2_)
Arrhenatherum elatius		1	2			II	(1-2)

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Juncus articulatus			5			I	(1-3)
Festuca rubra				4		I	(3_)
Scrophularia nodosa	4					I	(2_)
Kindbergia praelonga					4	I	(2_)
Pellia endiviifolia		3				I	(2-3)
Mentha aquatica			3			I	(2_)
Cirsium arvense			2			I	(4_)
Lathyrus pratensis			2			I	(1-2)
Vicia cracca			2			I	(2_)
Calystegia sepium	2					I	(2_)
Cirsium palustre				1		I	(1_)
Heracleum sphondylium				1		I	(1_)
Plantago lanceolata		1				I	(2_)
Angelica sylvestris				1		I	(2_)

U4a *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland Typical sub-community

Table 74 – U4a Community Attributes

Attribute	NVC code – U4a
Broad habitat type	Acid grassland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Lowland dry acid grassland
UKHabs code	g1a6
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Supporting habitat
Status	Para-maritime

Community constants common bent, sweet vernal-grass, sheep's fescue, heath bedstraw and tormentil are all well represented suggesting considerable correspondence with U4 acid grassland. The general low frequency of Yorkshire fog, suite of forbs present and appearance of ling heather suggest most affinity with the Typical sub-community.

This grassland community was recorded in one field which appears to support unimproved grassland at the top of Speeton Cliff. The field includes an ancient earthwork and Jackdaw Crag and supports a matrix of U4a on thin, acid soils, maritime grassland on limited areas

(MC9e), Yorkshire fog dominated grassland (MG10) on deeper soils, and gorse scrub (W23).

In this expression of U4a grazing appears to be light and pleurocarpous mosses are generally abundant with springy turf-moss joined by neat feather-moss and the heathland moss heath plait-moss. Ling heather and bilberry were encountered in this community, and it is considered likely that the grassland is derived from acid heath.

Lack of grazing is allowing the sward to become rank.

Table 75 – The following species were recorded in this community.

Species	DAFOR
Festuca ovina	D
Agrostis capillaris	A
Rhytidiadelphus squarrosus	A
Anthoxanthum odoratum	A
Potentilla erecta	F
Galium saxatile	F / LA
Pseudoscleropodium purum	F
Rumex acetosa	F
Holcus lanatus	O / LF
Hypnum jutlandicum	O
Calliergonella cuspidata	O
Festuca rubra	O
Hypochaeris radicata	O
Calluna vulgaris	O
Rumex acetosella	O
Dicranum scoparium	O
Agrostis stolonifera	O
Plantago lanceolata	O
Vaccinium myrtillus	O
Veronica chamaedrys	O
Teucrium scorodonia	O
Achillea millefolium	R
Heracleum sphondylium	R
Lotus corniculatus	R

Table 76 – The following quadrat data was recorded for U4a, blank cells indicate species not recorded.

Species	Q1	Q2	Q3	Q4	Q5	Frequency	Abundance
Quadrat location - OS Grid TA	1564 7508	1560 7508	1579 7504	1584 7504	1597 7501		
Sward height (cm)	14	13	15	13	16		
Bare ground (%)	0	0	0	0	0		
Festuca ovina	9	8	7	9	7	V	(7-9)
Agrostis capillaris	5	5	7	4	8	V	(4-8)
Rhytidiadelphus squarrosus	4	4	4	4	5	V	(4-5)
Anthoxanthum odoratum	4	5	3	3	3	V	(3-5)
Potentilla erecta	3	3	2	3	3	V	(2-3)
Galium saxatile	5	4	3	3	1	V	(1-5)
Pseudoscleropodium purum	4	4	4		3	IV	(3-4)
Rumex acetosa		2	2	2	3	IV	(2-3)
Holcus lanatus			3		4	II	(3-4)
Hypnum jutlandicum	3			4		II	(3-4)
Calliergonella cuspidata				4		I	(4_)
Festuca rubra					4	I	(4_)
Hypochaeris radicata	3					I	(3_)
Calluna vulgaris				3		I	(3_)
Dicranum scoparium				3		I	(3_)
Agrostis stolonifera		2				I	(2_)
Plantago lanceolata					2	I	(2_)
Vaccinium myrtillus				2		I	(2_)
Veronica chamaedrys					2	I	(2_)
Teucrium scorodonia					2	I	(2_)
Achillea millefolium					1	I	(1_)
Heracleum sphondylium					1	I	(1_)
Lotus corniculatus					1	I	(1_)

W1 *Salix cinerea – Galium palustre* woodland

Table 77 – W1 Community Attributes

Attribute	NVC code – W1
Broad habitat type	Wet Woodland
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Wet Woodland
UKHabs code	w1d
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Supporting habitat
Status	Sub-maritime / Para-maritime

W1 wet woodland was recorded as an element of the soft cliff vegetation above Speeton Sands and is a part of the dynamic mosaic of habitats on these cliffs. Grey willow is an opportunist invading moist mineral soils in situations where there is a period free of standing surface water in early summer which facilitates germination of the windborne seeds. Thus W1 wet woodland can readily form where rotational slippage has allowed formation of seasonal wetlands and there is much bare ground.

Groundflora associations on soft cliff are varied and much of the variation is due to chance. Early succession can involve jointed-rush, common fleabane, grass-of-Parnassus, creeping bent and colt's-foot, however, light demanding species wane as the trees develop. Once a canopy has formed shade tolerant species such as soft rush, wild angelica and meadowsweet become more prominent.

W8 *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland

Table 78 – W8 Community Attributes

Attribute	NVC code – W8
Broad habitat type	Other woodland - broadleaved
UK BAP Habitat (UK Habitat Classification Working Group (2018))	No
UKHabs code	w1g7
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Supporting habitat
Status	Para-maritime

Woodland with characteristics of W8 was recorded in a limited number of locations with main extents being at Dane's Dyke Country Park, South Landing, Old Beck on Speeton Cliff and The Gill at Reighton Sands Holiday Park.

The Gill at Reighton Sands Holiday Park has a canopy dominated by sycamore *Acer pseudoplatanus* with some ash *Fraxinus excelsior* and occurs in a sheltered gill behind the soft cliffs. Groundflora features herb robert *Geranium robertianum*, hart's-tongue fern *Asplenium scolopendrium*, wood avens *Geum urbanum*, bramble *Rubus fruticosus*, broad buckler fern *Dryopteris dilatata*, male fern *Dryopteris filix-mas*, hedge woundwort *Stachys sylvatica*, red campion *Silene dioica*, primrose *Primula vulgaris* and mosses including common feather-moss *Kindbergia praelonga* and common pocket-moss *Fissidens taxifolius*. There is a mettled track running up the edge of the wood, and track along the gill to a sewage works within the wood.

The woodland along Old Beck is also a gill woodland and marks the boundary between soft cliffs and the harder chalk of Speeton Cliffs. The canopy is similarly dominated by sycamore with some ash, and the groundflora is also similar, although dog's mercury *Mercurialis perennis* is locally frequent, and bluebells *Hyacinthoides non-scripta*, false brome *Brachypodium sylvaticum* and wood speedwell *Veronica montana* were recorded. Primrose is frequent throughout, and ferns are abundant in this sheltered gill with hard shield-fern *Polystichum aculeatum* and scaly male fern *Dryopteris affinis* agg joining broad buckler fern, male fern and hart's-tongue fern. The invasive non-native species pink purslane *Claytonia sibirica* was recorded.

South Landing is a Country Park and mature broad-leaved woodland occurs in the steep sided valley called South Sea Plantation. Dominated by sycamore the woodland also has many ash and beech Fagus sylvatica in the canopy. The understorey is well developed and dominated by young ash, sycamore and wych elm *Ulmus glabra* with hawthorn *Crataegus monogyna* and elder *Sambucus nigra*. Woodland groundflora is well developed and has much affinity with W8e *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland *Geranium robertianum* sub-community.

At Dane's Dyke Country Park mature broad-leaved woodland occurs on the steep sided stream valley. The canopy is dominated by beech sycamore and ash. A variety of other species are scattered through the woodland including horse chestnut *Aesculus hippocastanum*, English oak *Quercus robur*, wild cherry *Prunus avium* and Norway maple *Acer platanoides*. The latter is regenerating freely throughout the woodland. The shrub layer is usually well developed, and where breaks in the canopy occur, regeneration is very good with many young specimens of sycamore, ash and Norway maple.

Woodland groundflora has much affinity with W8e *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland *Geranium robertianum* sub-community.

W21 *Crataegus monogyna – Hedera helix* scrub

Table 79 – W21 Community Attributes

Attribute	NVC code – W21
Broad habitat type	Supralittoral rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime cliff and slope
UKHabs code	s2a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

The community has a limited distribution consisting of small thickets on the cliff top with some more substantial thickets on the soft cliff at Speeton Sands. On soft cliff ground flora can be well developed and fern-rich.

W22c *Prunus spinosa – Rubus fruticosus* agg. scrub; *Dactylis glomerata* sub-community

Table 80 – W22c Community Attributes

Attribute	NVC code – W22c
Broad habitat type	Supralittoral rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime cliff and slope
UKHabs code	s2a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

Thickets of wind-clipped blackthorn Prunus spinosa occur regularly on the south side of Flamborough Headland as far as the lighthouse. From the lighthouse to Speeton Cliffs the community was not encountered.

On the soft cliffs above Speeton Sands large areas are dominated by blackthorn where cliffs have stabilised for a period. Groundflora tends to be species poor in the dense shade dominated by ferns including hart's-tongue fern, broad buckler fern, hard shield fern and male fern. In some expressions sycamore Acer pseudoplatanus is established (e.g. TN47) and it is likely these stands will develop into woodland over time unless an erosion event occurs.

W23 *Ulex europaeus – Rubus fruticosus* scrub

Table 81 – Community Attributes

Attribute	NVC code – W23
Broad habitat type	Supralittoral rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime cliff and slope
UKHabs code	s2a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

European gorse *Ulex europaeus* is well established around this coast with expressions east of South Landing, a large area at North Landing and gorse forming part of the soft cliff matrix of habitats above Speeton Sands. On the soft cliff continuous gorse scrub is broken up through soft cliff erosion creating a complex array of micro-niches quickly colonised by soft cliff species.

W24 *Rubus fruticosus – Holcus lanatus* underscrub

Table 82 – W24 Community Attributes

Attribute	NVC code – W24
Broad habitat type	Supralittoral rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime cliff and slope
UKHabs code	s2a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

There are occasional bramble thickets on the soft cliff at Speeton Sands as part of the mosaic of soft cliff communities, and small patches throughout the survey area where conditions are favourable. More extensive expressions occur at Flamborough Head on perched soft cliff, with further patches recorded at North Landing and Thornwick Bay.

W25 *Pteridium aquilinum – Rubus fruticosus* underscrub

Table 83 – W25 Community Attributes

Attribute	NVC code – W25
Broad habitat type	Supralittoral rock
UK BAP Habitat (UK Habitat Classification Working Group (2018))	Maritime cliff and slope
UKHabs code	s2a5
Element of H1230 Vegetated Sea cliffs of the Atlantic and Baltic Coasts	Yes
Status	Sub-maritime

Bracken was not abundant in the survey area occurring in a few sheltered spots to the east of South Landing and some limited expressions elsewhere.

Invasive Non-native Species

Scrub

Japanese rose Rosa rugosa was noted at a number of locations generally associated with habitation (e.g. TN12) or spreading via its suckering habit from adjacent land (e.g. TN30 and TN32). Japanese rose was also encountered in mixed amenity planting within the survey area (e.g. TN48) where Fuchsia sp has also been planted. Fuchsia magellanica is also naturalised as a garden escape on soft cliffs at Speeton Sands (TN20).

Cotoneaster sp is known to be problematic on inland limestone cliffs where it can shade out native vegetation. Cotoneaster divaricatus was recorded on the south facing cliffs and has the potential to impact cliff vegetation here (e.g. at TN36 and TN37).

The soft cliff is vulnerable to invasion, and Lonicera nitida was observed colonising at TN25 close to Reighton Sands Holiday Park.

Perennial Vegetation

Montbretia and Shasta daisy are both well established as garden escapes on soft cliff at Speeton Sands (e.g. TN21, TN23, TN24), and close to habitation at Thornwick Bay Montbretia and Shasta daisy are present on perched soft cliff (TN27). Both species are also present along with other garden escapes in grassland on the cliff top associated with Reighton Sands Holiday Park (TN46).

Montbretia is the most widespread INNS and was recorded on perched soft cliff at Thornwick Bay (TN26) and North Landing (TN28) and cliffs north of Flamborough Head lighthouse (TN29). The species is also naturalised at South Landing (TN34).

Kniphofia is present on the cliff south of Flamborough Head lighthouse (TN31), although this appeared poorly grown at the time of the survey.

Perhaps the biggest threat to maritime cliff and slope vegetation observed is the sustained tipping of waste material from Reighton Sands Holiday Park onto the cliff at TN22.

Target Notes

Table 84 – Target Notes are tabulated below.

TN	Note
1	Large tufa spring
2	Base-rich flush with glaucous sedge, false fox sedge, marsh arrow-grass, jointed rush and common fleabane
3	Spring with *Lysimachia maritima*

TN	Note
4	Spring with *Lysimachia maritima*
5	Wetland dominated by common spike-rush and branched bur-reed
6	Early succession pond with much open water
7	Wetland dominated by common spike-rush
8	Perched saltmarsh with *Juncus gerardii* and *Lysimachia maritima*
9	Good example of M10
10	M10 flush of limited extent.
11	Wetland dominated by reedmace rapidly eroding.
12	INNS *Rosa rugosa* present
13	Area showing classic rotational slippage erosion
14	Naturalised INNS present; *Montbretia* and Shasta daisy.
15	Naturalised INNS present; *Montbretia* and Shasta daisy.
16	M27 community of limited extent.
17	Naturalised INNS present; *Montbretia* and Shasta daisy.
18	Naturalised INNS present; *Montbretia*
19	MC10b maintained by trampling at Flamborough Head
20	Naturalised INNS; *Fuchsia magellanica*
21	Naturalised INNS present; *Montbretia* and Shasta daisy.
22	Tipped material on a regular basis from caravan site. Threatens species-rich maritime vegetation.
23	Naturalised INNS present; *Montbretia* and Shasta daisy.
24	Naturalised INNS present; *Montbretia*
25	Naturalised INNS present; *Lonicera nitida*
26	Naturalised INNS present; *Montbretia*
27	Naturalised INNS present; *Montbretia* and Shasta daisy.
28	Naturalised INNS present; *Montbretia*
29	Naturalised INNS present; *Montbretia*
30	INNS *Rosa rugosa* spreading into SSSI from golf course
31	Naturalised INNS present; *Kniphofia*
32	Large patch of *Rosa rugosa*
33	Evidence of fertiliser drift affecting maritime vegetation.
34	Naturalised INNS present; *Montbretia*
35	Very thin strip of MC10b at top of cliff

TN	Note
36	Naturalised INNS present; *Cotoneaster divaricatus*
37	Naturalised INNS present; *Cotoneaster divaricatus*
38	Eutrophication caused by grass clippings from cricket club
39	Bryophyte rich spring with *Calliergonella cuspidata, Trichostomum crispulum,* various orchids and brookweed.
40	M38 spring with *Palustriella commutata*, *Pellia endiviifolia*, brookweed, glaucous sedge, jointed rush, hard rush, field horsetail and marsh thistle.
41	MG12a on steep slope as element of perched soft cliff (boulder clay over chalk cliff).
42	M27 community of limited extent.
43	SD5 *Leymus arenarius* mobile dune community associated with steps up the cliff.
44	Coastal grassland with high invertebrate potential.
45	MC6 established on the cliff top due to maritime up-draught and airborne nutrients from cliff nesting birds.
46	MG1 grassland with much Shasta daisy, *Montbretia* and other garden escapes
47	Continuous W22 blackthorn scrub with sycamore dotted throughout. Some sycamore mature.
48	Amenity shrub planting featuring *Fuchsia* sp, *Rosa japonica*, *Salix alba, Salix caprea, Sambucus nigra*

Mosaic Data

Table 85 – Where mosaics are shown on the figures they are labelled with a unique code from A – X. The sub-communities present and percentages are as indicated below.

Mosaic Code	NVC	% cover
A	MG1a/W23	60/40
B	MG1a/W21	70/30
C	MG5b/MG11b	80/20
D	MG1a/W21	70/30
E	CG2c/W23	60/40
F	MG1a/W21	70/30
G	W24/W21	80/20
H	W23/V4a	60/40

Mosaic Code	NVC	% cover
I	AR**/MC8f	55/45
J	AR**/MC8f	55/45
K	AR**/MC8f	55/45
L	MC9b/MG11b/MC8a	70/20/10
M	MC8a/MG11b	60/40
N	MG1a/Bramble	80/20
O	W24/S4b	70/30
P	MG11b/MC11b	55/45
Q	W23/MC11b	55/45
R	S4b/MG12/MG11b	50/40/10
S	MC11b/MG12a/MG11b	70/15/15
T	S4b/MG12a	60/40
U	MG11b/MG12	60/40
V	MG11b/MG12	60/40
W	MG11b/OV26	80/20
X	MG11b/OV26	80/20

Discussion

Comparison with previous vegetation survey

Previous vegetation survey of this study area was undertaken by Milliken and Pendry (2002) on behalf of English Nature. Reference to this report has been made to compare the results of the current survey with vegetation recorded in 2002. In addition to published NVC communities, Milliken and Pendry (2002) suggested further communities not currently described in NVC and the analogues of these communities recorded with reference to NVC have been used to inform comparison.

Sewerby to Flamborough Head and on the North Cliff

In the section from Sewerby to Flamborough Head the cliffs consist of chalk cliff with clayey overburden forming a perched soft cliff. In terms of the vegetation communities present there appears to be little change, although there is some evidence of increased eutrophication and an increase in OV26 community associated with flushes and run-off from arable farmland. This process is exacerbated where erosion has exposed field drain systems which then actively discharge water onto the soft cliff forming both a focus for erosion and a point source for nutrient rich run-off from the fields.

There has been an apparent increase in MG1 grassland at the expense of MG12a grassland, and perhaps coastal grassland also associated with eutrophication (perhaps airborne rather than through run-off and groundwater seepage). This process may also be driving an increase in bramble scrub in grassland and reedbeds. The extent of other scrub such as blackthorn is remarkably similar, however, there is an apparent decrease in European gorse.

North Cliff to Speeton Cliffs

Vegetation on these high, hard chalk cliffs does not seem to have changed much, although there is some evidence that where a low input grassland buffer has been created inland of the cliffs this is allowing coastal grassland to develop at the expense of MG1 coarse grassland. This is likely due to a reduction in drift of fertiliser onto coastal grassland systems from arable cropping regimes.

Speeton Cliffs to Reighton Gap

Comparison of vegetation here suggests that erosion rates may have increased on the extensive soft cliff resource. This is evidenced through increased extent of early succession vegetation communities and less grassland and scrub communities. More detailed analysis using aerial imagery may help to verify and quantify this impression,

however, the sea was actively eroding soft cliff during the survey, and there was much evidence of active slumping and disruption of stable dense scrub and grassland vegetation.

Comments on coastal erosion

Observations during this survey include recording where vegetation is being actively impacted by coastal erosion processes, and from this it is possible to infer that these are places where active coastal process are currently most abundant. However, it should be noted that these are observations of vegetation by an ecologist and in order to obtain accurate information about coastal erosion at this location a study by a qualified coastal geomorphologist is recommended.

Sewerby to Flamborough Head

Chalk cliffs on the south side of Flamborough Headland are relatively low and have substantial load of boulder clay leading to the formation of perched soft cliff which is actively eroding through slumping of clayey overburden. The chalk cliffs themselves are hard and stochastic erosion events occur infrequently. There was no evidence observed of a significant change in the chalk cliffs themselves since 2002.

A feature of perched soft cliff on chalk at Sewerby is the tendency for clay soils to deposit over the cliff to form large mounds at the base of the cliff (on the beach). Whilst usually rapidly eroded away, vegetation can persist for some years depending on season and weather.

Flamborough Head to North Cliff

There are a series of bays which characterise coast from Flamborough Head / North Landing to Thornwick Bay and North Cliff. The hard, chalk cliffs are lower at this location, and bays are formed of more rapidly eroding softer sediment in exposed, northwest facing locations associated between chalk cliffs, stacks and arches. Recent active erosion was apparent at Thornwick Bay to the east at High Holme and on the north-east facing slopes.

North Cliff to Speeton Cliffs

From North Cliff to Speeton Cliff the cliffs are high and consist of hard chalk which is subject to infrequent, stochastic erosion events. However, when these erosion events occur there is the potential for a large impact on coastal vegetation.

Speeton Cliffs to Reighton Gap

The soft cliff resource at Speeton Sands comprises actively eroding slopes stretching some 250m inland at Middle Cliff, New Closes Cliff, Gill Cliff and Black Cliff. The vegetation is a dynamic series of communities in time and space depending on constant erosion of the soft cliff to persist. Where active erosion is taking place large areas of bare soil and subsoil are frequently exposed for colonisation. During the survey it was noted that the sea is actively eroding the toe of the cliff and the beach is completely covered at high tide. Evidence of the rate of erosion was observed through the occurrence of World War 2 defence structures (concrete pill boxes and other infrastructure) which is now on the beach or moving down the slope.

Where major slumps have taken place on soft cliff, water often accumulates behind ridges created by rotational slippage. These perched wetlands are then rapidly colonised by wetland species with high dispersal capabilities (wind borne seed) such as reedmace. These wetland communities persist until wet woodland forms or the sea erodes the feature before succession can take place.

Scrub communities are well established on parts of the soft cliff, however, this should not be seen as permanent stabilisation of the soft cliff; there was also plenty of evidence of erosion causing the break up and decay of dense scrub.

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Appendices

Figure 1 – NVC 2022 Survey Maps (attached as separate document)

Appendix 1 – Quadrat Photographs (attached as separate document)

Appendix 2 – Overview of vegetation data (attached as separate spreadsheet)

Appendix 3 – NVC communities listed by Morphological Section (attached as separate document)

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