YSTRADFFIN HEP

ADDITIONAL

BRYOPHYTE MONITORING (BASELINE)

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GRITTEN ECOLOGY

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GrittenEcology

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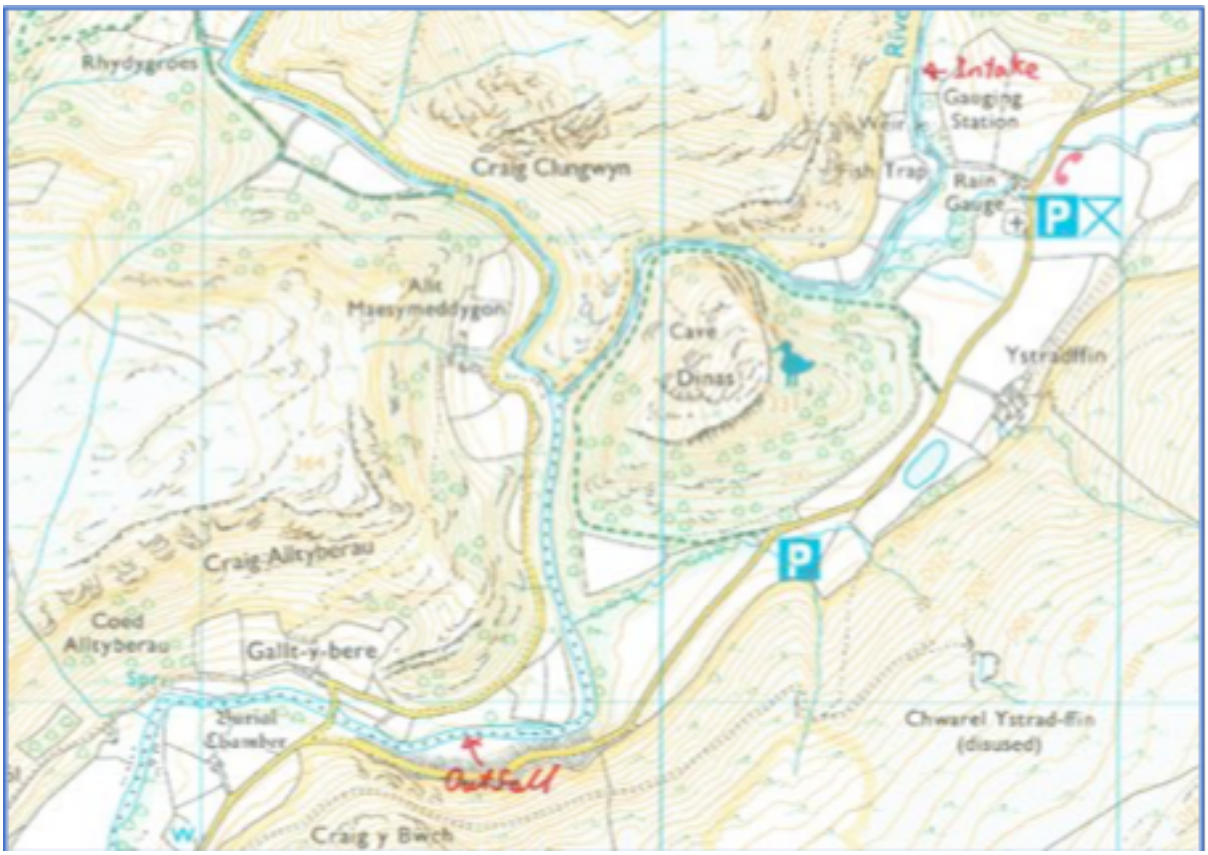
1.0 INTRODUCTION

A run-of-river Hydro-electric (HEP) scheme on the Afon Tywi at Ystradffin, Rhandirmwyn, Camarthenshire (**Map 1**), has been granted planning permission and the construction process is well under way. Whilst the Planning Application was being considered by the Local Planning Authority, concern was expressed by the RSPB that the distribution of a rare moss *Racomitrium macounii* ssp. *alpinum,* that was found in two previous surveys beside the river, might be affected by water abstraction. Accordingly, on 23-24 November 2019, **Gritten Ecology** attempted to establish a number of baseline quadrats containing the moss to establish whether water abstraction during the running of the HEP scheme would have a deleterious effect on the distribution/abundance of this very rare species. Unfortunately, no examples of the moss could be found at that time, so quadrats were established with two moss species that were considered to occupy similar habitat to *R. macounii* and with a similar morphology – *Racomitrium lanuginosum* and *Grimmia trichophylla*.



Map 1: Gwenffrwd Dinas RSPB reserve with the Intake and Outfall for the HEP scheme marked.

A further visit was made to the site on 28th September 2020 in the company of Richard Lansdown, who previously found *R. macounii* ssp *alpinum* in abundance on the site (Lansdowne (2011)) in order to establish baseline quadrats containing the species.

The weather at the time of this survey was overcast and drizzly but the water level was adequately low to allow access to the riparian boulders where the moss grows (see **Figure 1**). It is worth checking the river level before visiting the site of the quadrats since they are so close to the river: (https://rloi.naturalresources.wales/ViewDetails?station=4209).

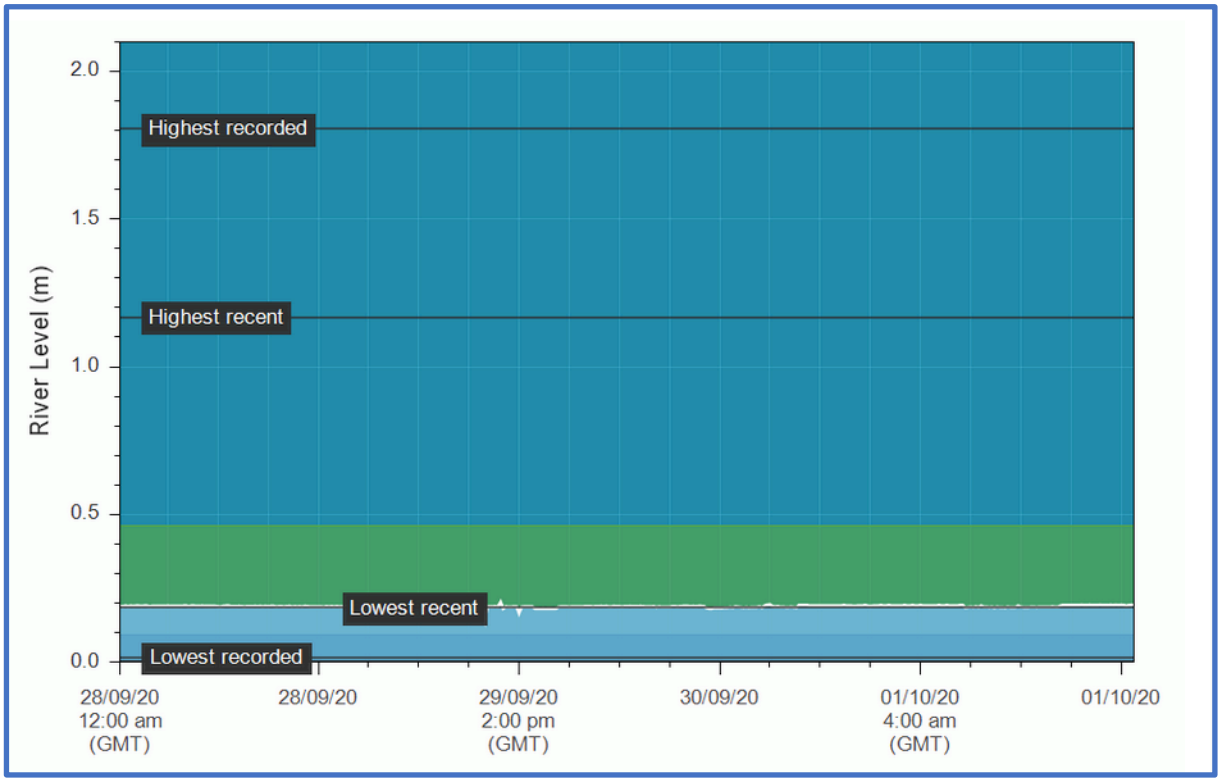


Figure 1: Water levels in the depleted reach of the Afon Tywi on the 28.9. 2020 survey.

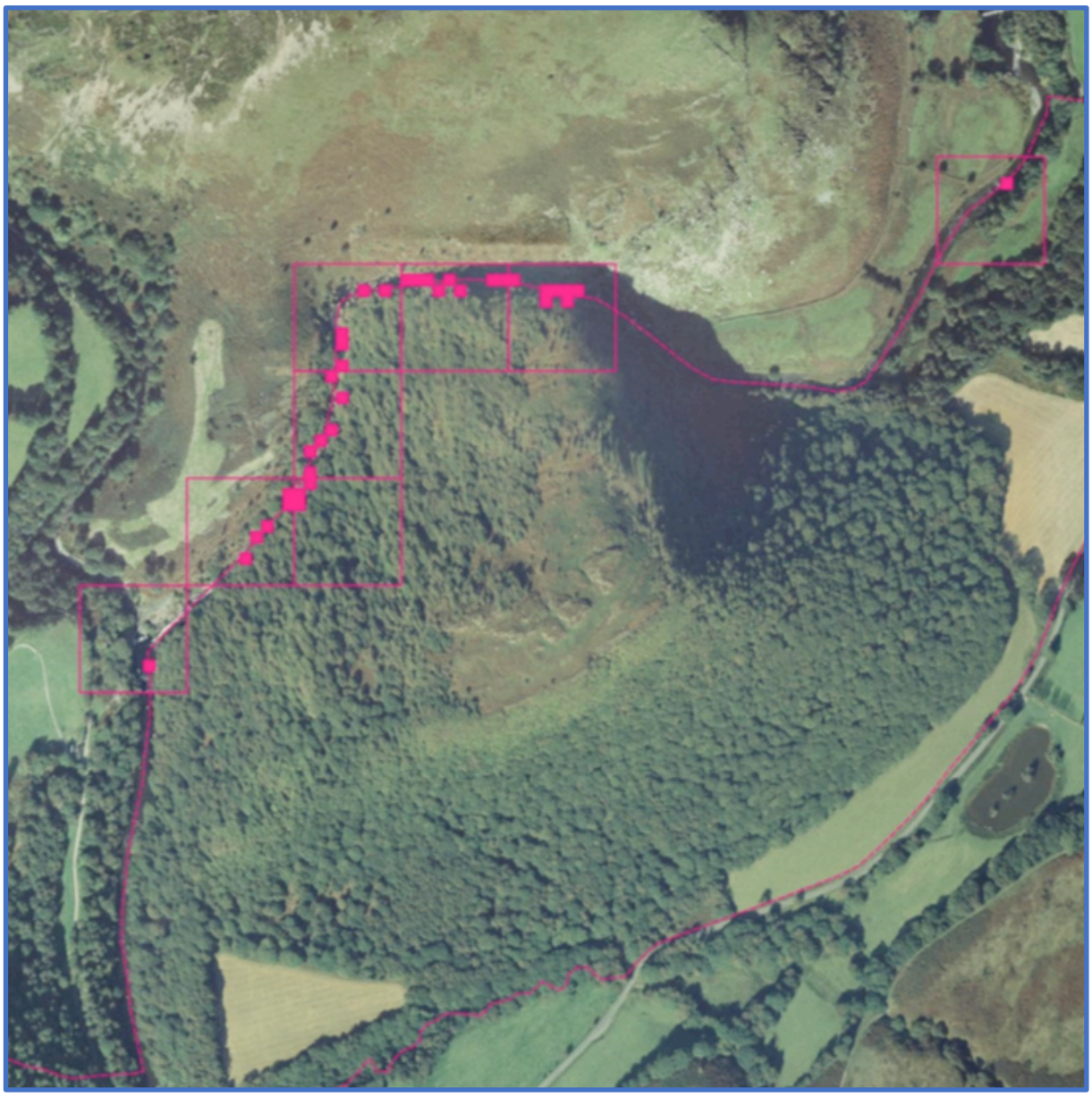
This additional report should be read in conjunction with the Gritten (2019) baseline survey report. However, it is appropriate here to repeat details of the methodology used in both the 2019 and 2020 surveys.

2.0 METHODOLOGY

The following methodology was used, based on similar protocols already established by **Gritten Ecology** in other rivers subject to HEP scheme proposals elsewhere.

1. Suitable sites with similar bryology were located within the depleted reach on the east bank within the area of *R. macounii* distribution shown in **Map 2**. This included sites with clear horizontal and vertical zonation. By and large, sites were selected at approximately the same height above the river and within the same distance from the river's edge. Several photographs were taken from progressively closer distances to aid relocation of each quadrat. A written description was also made to assist in quadrat site relocation.

2. Where possible, each quadrat site or suite of quadrat sites was selected with a future (re-monitoring) reproducible statistical analysis in mind and the proximity of prominent features. This latter is very important since future quadrat site relocation is crucial.
3. Whilst each site (and its landmark approaches) was described in detail, the reasons for the selection of each quadrat site was also described.
4. Aspect (using a compass), level to the horizontal (using Apple's iLevel Handy) and10-figure GPS NGRs (using a Garmin eTrex) were noted for each quadrat.
5. Each quadrat was 25 x 25 cm permanently marked with yellow rawl plugs, generally at the top two corners drilled into the rock with a portable SDS drill. In all cases, and especially where the bryophyte sward was deep, two corners were marked with stainless steel screws screwed into the rawl plugs (after the bryophytes had been monitored). (These can be very accurately relocated with a Garrett Pro-Pointer® All Terrain hand-held metal detector). Experience gained elsewhere shows that the use of rawl plugs alone is quite insufficient since a great deal of time and effort with a probing knitting needle needs to be utilised in order to relocate corner quadrat markers. This also can create a great deal of damage to the very bryophyte sward that is being measured. In any event, relocation of the quadrat corner markers, once the general area has been found with a metal detector, is best achieved by gentle probing with a knitting needle.



Map 2: The distribution of *R. macounii* along the Afon Tywi in the Gwenffrwd Dinas RSPB reserve (taken from Callaghan (2017).

6. A 220mm double point knitting needle was inserted into each of the two rawl-plugged holes. The top left and right corners of the quadrat (**Photo 1**) can be accurately positioned against the knitting needles or hung from them if the quadrat has been placed off the horizontal.
7. The quadrat is divided into a grid of 100 x 2.5cm^2 squares and the two principle species described above found in each square were noted.
8. A close-up photograph of each quadrat was taken (see **Photo 1**, for example).
9. Stainless steel screws screwed into rawl-plugs once bryophyte distribution recorded.

Photo 1: A Quadrat close-up.

3.0 RESULTS

Quadrat photographs are shown in **Appendix 1**. Data for each quadrat is shown in **Appendix 2**. Two sites were selected for monitoring amounting to five quadrats in all. Stands of *R. macounii* was located in each quadrat.

3.1 Installation of the quadrats

Access to the quadrat sites is from the RSPB Gwenffrwd Dinas car park at SN787471 at Ystradffin, near Rhandirmwyn. Leave the car park through a wooden 'lych' gate at the western side of the car park and proceed along the boardwalk into the reserve. At the end of boardwalk (SN 784468), turn right onto the Public Right of Way (**Map 1** above) until the RSPB reserve sign is reached (**Photo 2**). The path runs parallel to the river for 100 metres until a very prominent large boulder at the river edge is reached (**Photo 3**).

Photo 2: Directions to the site of Quadrats 1-3 are taken from the further ("Caution Rough Path") sign pictured here.

Photo 3: The conspicuous large boulder at the edge of the river.

Just a few metres downstream of this large boulder is the start of a jumble of boulders. Two conspicuous slabby boulders are present with the boulder on which Quadrats 1-3 are located shown marked by a red oval on **Photo 4**, just downstream again. **Photo 5** is a closer view of this rock.

Photo 4: Just downstream (red oval) of the two slabby boulders, which lie at right angles to the river, and close to the river's edge is the rock on which Quadrats 1-3 are located.

Important Note: To facilitate recording and close-up photography of the bryophyte cover of Quadrats 1-3 it is best to wear waders since it is likely standing in the river will be required.

Photo 5: A close-up view of the rock on which Quadrats 1-3 are located.

Close-up photographs of Quadrats 1-3 are shown in **Appendix 1**.

To reach the next quadrats, return back up to the main path and follow the path downstream (west) for 75 metres until a short flight of steps is reached (**Photo 6**). A sort of small gulley breaks down to the river from about two thirds of the way up these steps on the right. **Photo 7** shows a view of the river from the steps looking down the gulley. Scramble cautiously down the gulley and, looking downstream, a small three-stemmed Willow (*Salix cinerea*) can be seen about five metres away (**Photo 8**). Proceed carefully over a jumble of rocks to this small sapling. Quadrat 4 is located on a rock about one metre upstream of the tree. Quadrat 5 is located on a separate rock about one metre downstream of the tree at about 10.30 from the tree.

Photo 6: About 75 metres along the path downstream from Quadrats 1-3 is a short flight of steps.

Photo 7: Looking down to the river from about two-thirds of the way up the steps.

Photo 8: Looking downstream from the bottom of the gulley is a small three-stemmed Willow sapling (red arrow). Quadrats 4 and 5 are located within one metre of this tree.

4.0 DISCUSSION

Needless to say, each of the five quadrats selected contained stands of *R. macounii*. It was worth being accompanied during this survey by someone who knew the species well. As Richard Lansdowne explained, *R. macounii* ssp *alpinum* is not a species that can be easily identified in the field critically. Indeed, the description given by Smith (2006) is somewhat misleading since he puts some emphasis on the leaves having "usually reddish points". Lansdowne was of the opinion that the species is best identified by its "jizz" and indeed this was the case. This species stands out because it cannot be readily confused with any other *Racomitrium* species (*heterostichum, affine, lanuginosum, aciculare, aquaticum, fasciculare*) which are all present on the site. The best distinguishing character was found to be its reddish/deep green character. The reddish tinge was due to its reddish nerve rather than a reddish hair point which was never seen in the field in the reserve.

It is recommended that these five quadrats are re-monitored in 2022 along with the others detailed in Gritten (2019).

REFERENCES

Callaghan, D. (2017). *Ystradffin HEP: bryophyte survey and assessment of RSPB Gwenffrwd Dinas.* Unpublished Report

Gritten, R.H. (2019). Ystradffin HEP: Bryophyte monitoring (Baseline). Gritten Ecology, unpublished report.

Lansdown, R.V. (2011). *Bryophyte Survey of the River Towy (sic) from Rhuddallt to the meander bend downstream of Dinas Hill*. AMEC Environment and Infrastructure Ltd. Unpublished Report.

Smith, A.J.E. (2006). The moss flora of Britain. Cambridge University Press. ISBN No. 0521816408.

APPENDIX 1: Quadrat data.

YSTRADFFIN HEP: *RACOMITRIUM MACOUNII SSP ALPINUM*

Quadrat	1
Date	28.9.20
Height of bottom edge above water level (mm)	500
Aspect (faces)(°)	82
Screws	Top two corners
NGR	SN78210 46944
Photos	3126
Level (°)	18.8

	1	2	3	4	5	6	7	8	9	10	
A											
B											
C		Ra					Rm	Rm	Ra		Rm=2 Ra = 2
D	Rm	Rm	Rm	Rm	Rm	Rm	Rm			Rm	Rm=8
E	Rm	Rm	Rm	Rm	Rm	Rm			Rm	Rm	Rm=8
F	Rm	Rm	Rm	Rm Shp	Rm Shp					Rm	Rm=6
G	Rm	Rm	Rm	Rm	Rm	Rm					Rm=6
H				Rm	Rm	Rm	Rm Ra	Rm Ra		Ra	Rm=5 Ra = 3
I											
J			Ra								Ra = 1

Abbreviations: Rm = *Racomitrium macounii* ssp. *alpinum*, Ra = *Racomitrium aciculare.*
Notes: Waders required to reach this site.

YSTRADFFIN HEP: *RACOMITRIUM MACOUNII SSP ALPINUM*

Quadrat	2
Date	28.9.20
Height of bottom edge above water level (mm)	300
Aspect (faces)(°)	As Q1
Screws	Top two corners
NGR	As Q1
Photos	3127, 3129
Level (°)	24

	1	2	3	4	5	6	7	8	9	10	
A		Ra	Ra					Ra	Ra	Ra	Ra = 5
B	Ra	Ra						Ra		Ra	Ra = 4
C	Ra Shp	Shp					Ra		Ra	Ra	Ra = 4 Shp=2
D	Shp Ra	Shp Ra			Ra	Ra	Ra	Ra	Ra	Ra	Shp=2 Ra =8
E	Pu Ra	Ra	Ra	Ra	Ra				Ra		Pu=1 Ra =6
F	Pu Ra	Ra Rm	Ra Rm	Ra	Ra	Ra	Ra	Shp	Ra Shp		Pu=1 Ra=8 Rm=2
G	Ra Rm	Ra Rm	Rm	Ra Rm	Rm	Ra Rm	Ra Rm	Ra	Ra	Ra	Ra =8 Rm =7
H	Rm	Rm	Rm	Rm	Rm Ra	Rm Ra	Ra	Ra	Rm	Rm	Ra =4 Rm =8
I	Bs Ra Rm	Ra Rm	Rm	Rm	Ra Rm	Ra Rm	Ra Rm	Ra Rm	Rm	Ra Rm	Bs = 1 Ra =7 Rm=10
J	Ra	Ra Rm	Ra Rm	Ra Rm	Ra Rm	Rm	Rm	Rm	Rm	Ra Rm	Ra =6 Rm =9

Abbreviations: Rm = *Racomitrium macounii* ssp. *alpinum*, Ra = *Racomitrium aciculare*, Shp = *Sciuro-hypnum plumosum,* Bs = *Bryum pseudotriquetrum,* Pu = *Pogonatum urnigerum*.
Notes: Waders required to reach this site.

YSTRADFFIN HEP: *RACOMITRIUM MACOUNII SSP ALPINUM*

Quadrat	3
Date	28.9.20
Height of bottom edge above water level (mm)	500
Aspect (faces)(°)	31
Screws	Top two corners
NGR	As Q1 and Q2
Photos	3128, 3129
Level (°)	3.8 (Almost horizontal!)

	1	2	3	4	5	6	7	8	9	10	
A				Ra							Ra =1
B				Ra							Ra = 1
C		Ra	Ra	Ra			Ra				Ra =4
D	Ra	Ra					Ra Rm	Ra	Ra		Ra =5 Rm=1
E	Ra	Ra	Ra			Rm	Ra Pu Rm	Ra Rm	Ra		Ra =6 Pu =1 Rm=3
F	Ra	Shp		Ra	Ra	Ra Rm	Ra Pu Rm	Ra	Ra		Ra =7 Shp=1 Pu=1 Rm=2
G		Shp	Ra Shp Rm	Ra Rm	Rm	Pu Rm	Pu Rm	Rm	Ra		Shp=2 Ra=3 Pu=2 Rm=6
H			Rm	Pu Ra Rm	Pu Rm	Rm	Rm	Rm			Pu=2 Ra=1 Rm=6
I			Ra Rm	Pu Ra Rm	Rm	Rm	Shp Rm	Shp Rm	Shp Ra	Ra	Ra=4 Pu=1 Shp=3 Rm=6

J			Ra	Ra Rm	Ra Rm	Ra Rm	Shp Ra Rm	Shp Ra	Shp	Shp Ra	Ra=7 Shp=4 Rm=4
Abbreviations: Rm = *Racomitrium macounii* ssp. *alpinum*, Ra = *Racomitrium aciculare*, Shp = *Sciuro-hypnum plumosum*, Pu = *Pogonatum urnigerum*.											
Notes: Waders required to reach this site.											

YSTRADFFIN HEP: *RACOMITRIUM MACOUNII SSP ALPINUM*

Quadrat	4
Date	28.9.20
Height of bottom edge above water level (mm)	1005
Aspect (faces)(°)	350
Screws	Top two corners
NGR	SN 7814946982
Photos	3133
Level (°)	28

	1	2	3	4	5	6	7	8	9	10	
A	Rm	Rm	Ra Rm	Ra	Rm	Ra Rm	Ra Rm	Rm	Ra Rm	Ra	Ra=6 Rm=8
B	Rm	Rm	Rm	Ra Rm	Ta Ra Rm	Ta Ra Rm	Ta Ra Rm	Ta Ra Rm	Rm	Ra	Ra=6 Ta=4 Rm=9
C	Rm	Rm	Ra Rm	Ra Rm	Ta Rm	Ta Rm	Ta Rm	Ta Ra Rm	Rm	Ra Rm	Ra=4 Ta=4 Rm=10
D	Ra Rm	Ra Rm	Ra Rm	Ra Rm	Ra Rm	Ta Rm	Ta Rm	Ta Rm	Ta Rm	Ra Rm	Ra=6 Ta=4 Rm=10
E	Rm	Ta Rm	Rm	Ra Rm	Ra Rm	Ta Rm	Ta Rm	Ta Rm	Ta Rm	Rm	Ra=2 Ta=5 Rm=10
F	Rm	Ta Rm	Rm	Rm	Rm	Ta Rm	Rm	Ta Rm	Ta		Ta=4 Rm=8
G	Rm	Ta Rm	Rm	Rm	Rm	Rm	Rm	Rm	Rh	Ra	Ta=1 Ra=1 Rh=1 Rm=8
H	Ta Rm	Ta Rm	Rm	Rm	Rm	Rm	Rm	Rm	Rh		Ta=2 Rh=1 Rm=8
I	Ra			Ra	Ra	Ra	Rm	Ra Rm	Ra Shp	Shp	Ra=6 Shp=2 Rm=2
J					Ra			Ra	Ra	Ra	Ra=4

Abbreviations: Rm = *Racomitrium macounii* ssp. *alpinum*, Ra = *Racomitrium aciculare,* Shp = *Sciuro-hypnum plumosum*, Ta = *Thamnobryum alopecurum*, Rh = *Racomitrium heterostichum*.

Notes: Quadrat 4 is one metre upstream of small *Salix cinerea* .

YSTRADFFIN HEP: *RACOMITRIUM MACOUNII SSP ALPINUM*

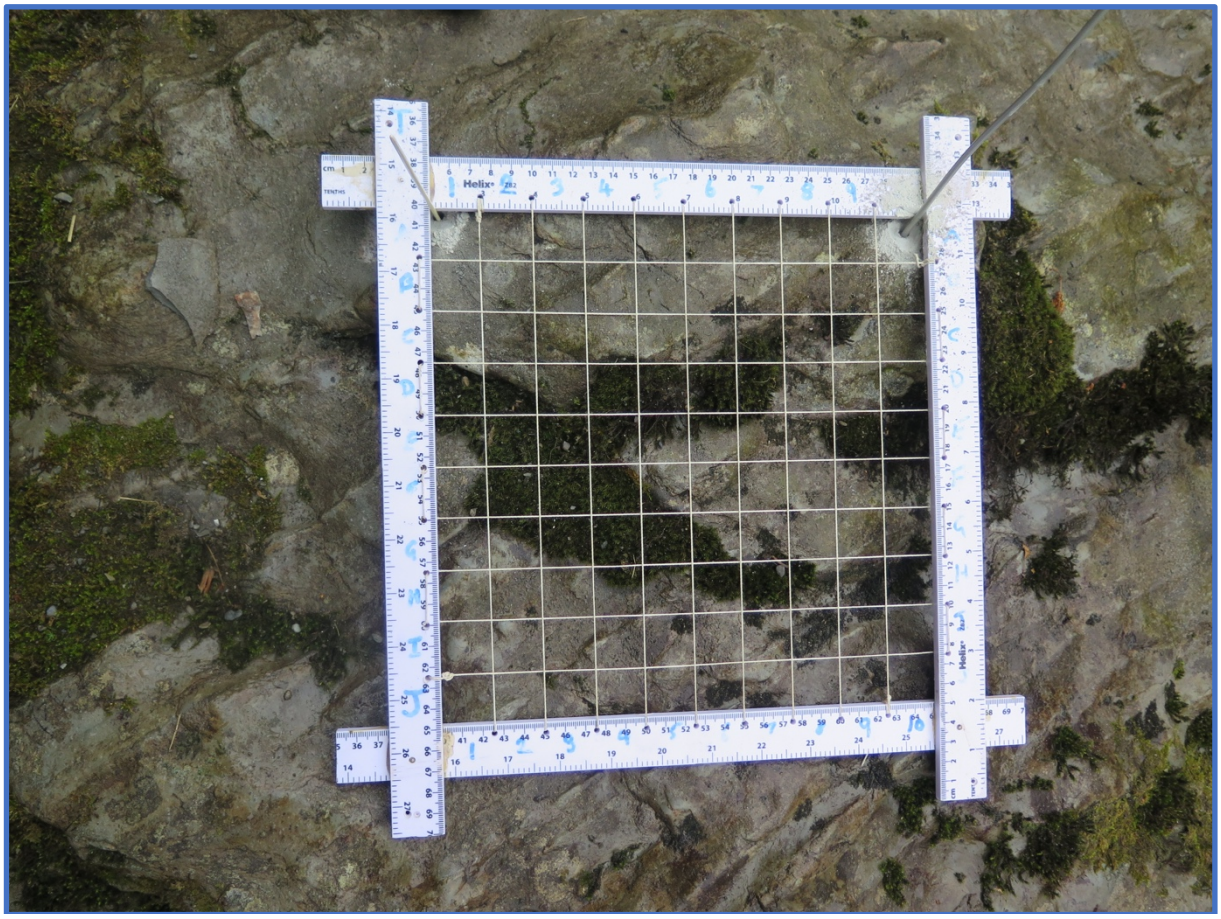
Quadrat	5
Date	28.9.20
Height of bottom edge above water level (mm)	1380
Aspect (faces)(°)	100
Screws	Top two corners
NGR	As Quadrat 4
Photos	3134, 3135
Level (°)	45

	1	2	3	4	5	6	7	8	9	10	
A	Ta	Ta Cf	Ta Cf	Cf	Me Cf	Me	Me	Me	Me	Cf Me	Ta=3 Cf=5 Me=6
B	Shp	Shp Cf	Shp Cf	Shp Cf	Cf	Cf	Shp	Cf	Cf	Cf Me	Shp=5 Cf=8 Me=1
C	Rh Shp Cf	Shp Cf	Shp Cf	Rh Cf	Shp Cf	Cf	Shp Rh	Rh Cf	Cf		Rh=4 Shp=5 Cf=8
D	Cf	Rm	Rm	Rm	Rm	Rm	Cf Rh	Rh	Rh	Rh	Cf=2 Rh=4 Rm=5
E	Cf Rh	Cf Rh Rm	Rm	Rm	Rm	Rm	Rh	Rh	Rh		Cf=2 Rh=5 Rm=5
F	Ra Rh	Rh		Rm	Rh Rm	Rh		Rh	Rh	Rh	Ra=1 Rh=7 Rm=2
G	Rh	Rh		Rh	Rh	Rh	Rh	Rh	Rh	Rh Cf	Rh=9 Cf=1
H				Rh Cf	Rh	Rh	Rh	Rh	Rh	Rh	Rh=7 Cf=1
I		Rh					Cf	Cf Me			Rh=1 Cf=2 Me=1
J	Rh						Rh	Rh Cf	Rh		Rh=4 Cf=1

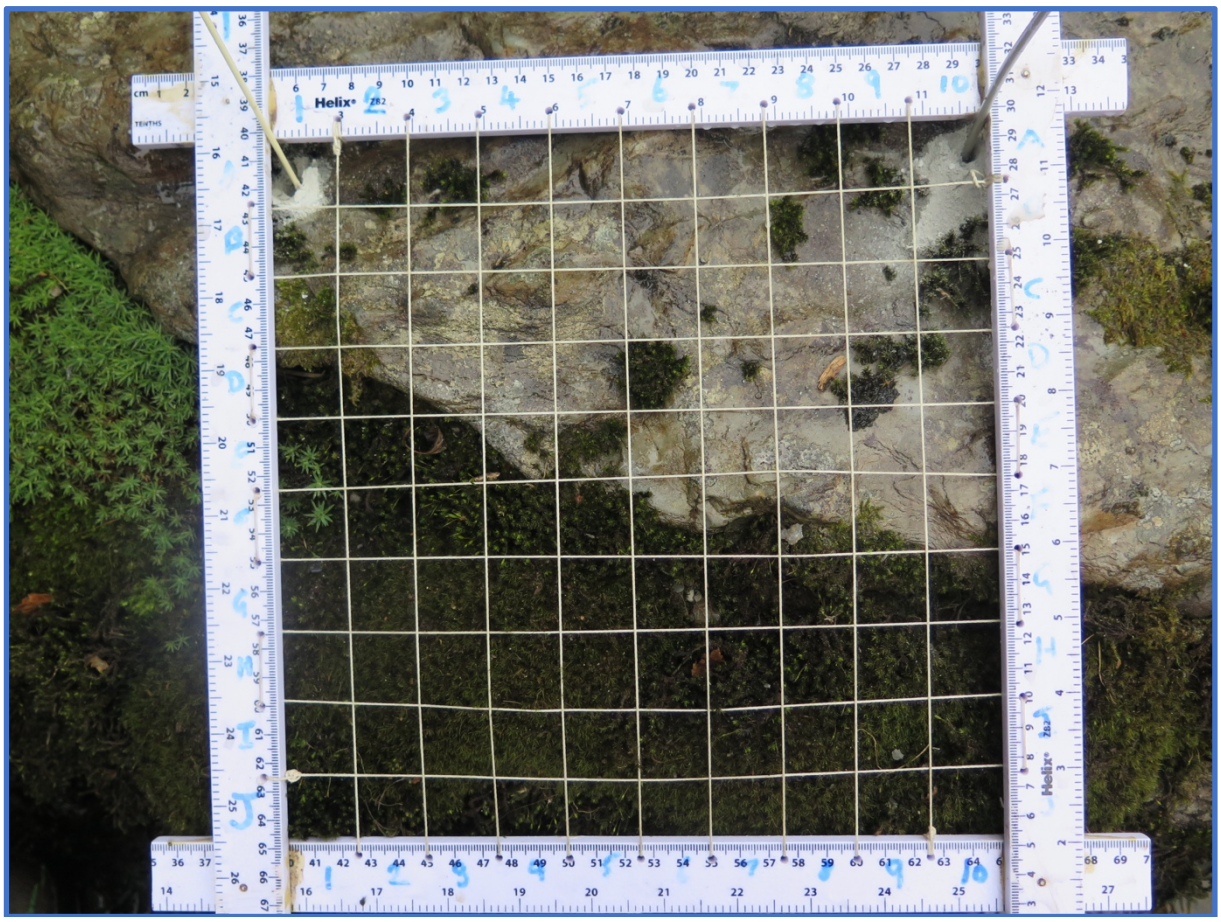
Abbreviations: Rm = *Racomitrium macounii* ssp. *alpinum*, Ra = *Racomitrium aciculare*, Shp = *Sciuro-hypnum plumosum*, Ta = *Thamnobryum alopecurum*, Rh = *Racomitrium heterostichum*, Cf = *Campylopus flexuosus*, Me = *Marsupella emarginata*.

Notes: One metre downstream of *Salix cinerea* and at 10.30 from tree when looking downstream.

APPENDIX 2: Quadrat photographs.

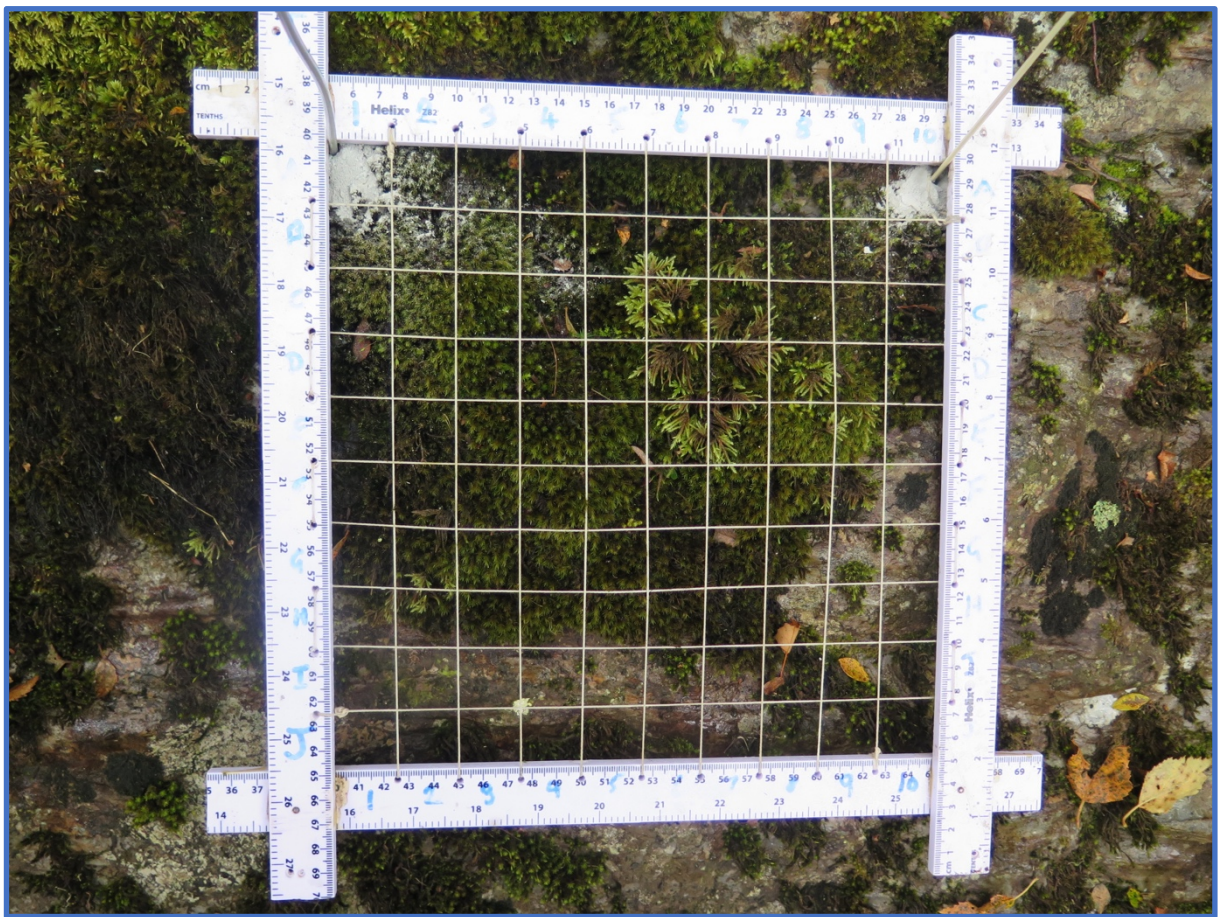


3126: Quadrat 1.

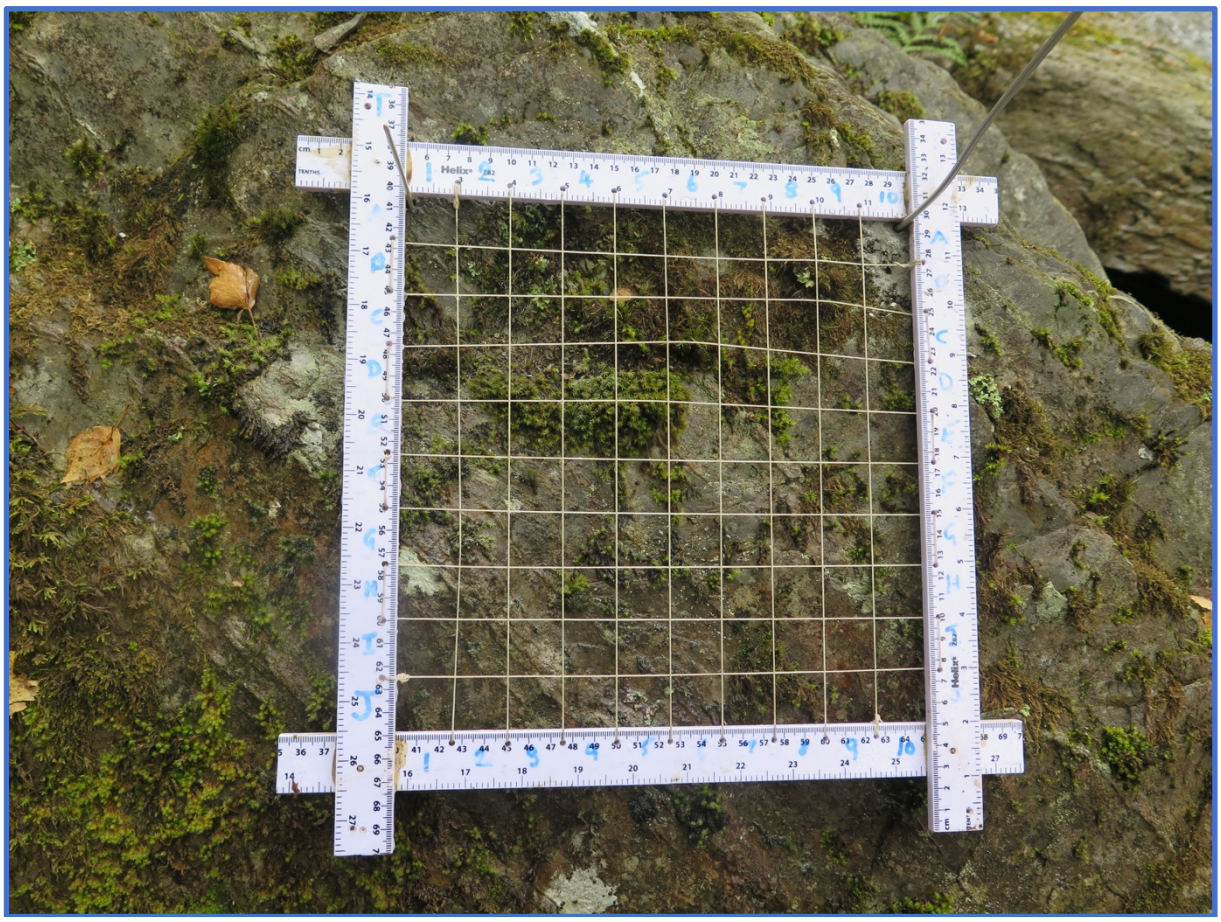


3127: Quadrat 2.

3128: Quadrat 3. (Photographed from above, hence upside down).



3133: Quadrat 4.



3134: Quadrat 5.

3135: Quadrat 5.