Site Visit Observations & Recommendations

Part 2

4 Liermåsan & Bliksrudmåsan

SUNDEWECOLOGY

Client	County Governors of Oslo & Akershus	
Author	Deborah Land	
Contact	Sundew Ecology 10 Glebe Close Keswick Cumbria CA125QQ	sundewecology@gmail.com +44 7961 768101
Date	November 2018	

Contents

List of Figures

List of Photos

List of maps

Site visit:

25 October 2018

Attended by:

Deborah Land	Sundew Ecology
Ingrid Verne	Fylkesmannen i Oslo og Akershus
Lars Selbekk	Haldenvassdraget Vannområde

Observations

Liermåsan & Bliksrudmåsan together with its intact neighbour Vålermåsan, are a macrotope of concentric mires located north of Bjørkelangen, within the municipality of Aurskog-Høland, in the County of Akershus. The mires have formed in a wide river valley, which also supports a number of smaller mires (Map 1 & 2).

Almost all of the mires within this area appear to have undergone some form of modification, from peripheral drainage and localised peat cutting to large-scale extensive commercial extraction. Liermåsan & Bliksrudmåsan have both been subject to a long history of commercial extraction.

The earliest available aerial photographs date from 1967 and clearly show extensive peat excavation across both Liermåsan & Bliksrudmåsan (Map 3). The original method would have been hand cutting but this would have given way to the more efficient machine block cutting. This method cuts and stacks the peat leaving it to dry until light enough to transport. This method leads to leaving a pattern of hollow and raised areas referred to as “baulks” before abandoning the area (Manatoba Peatlands, 2018). Two areas of old block cutting are still evident.

Peat milling on the other hand relies heavily on the establishment of an efficient network of drainage (Map 4). The surface is levelled and drains placed approximately 15m apart creating large flat milling fields. These are often cambered to aid drainage. Once established, these milling fields can support the heavy extraction machines such as a vacuum harvester. As the peat depth decreases with every harvest, more and more drainage is needed, requiring drains to be dug deeper for the next harvest season (Manatoba peatlands, 2018).

In addition to the regular in-field drains, there is also a large central drain taking water southwards and perimeter drains on either side also draining southwards. These have been dug into the peat body separating lobes of peat from the main body. The eastern drain issues via a very large drain into the Lierelva (Photo 1).

PHOTO 1 LARGE EXIT DRAIN TO LIERELVA

PHOTO 2 NORTHERN EXTENT OF LIERMÅSAN

Very little vegetation exists on Liermåsan, confined to small dry remnants of bog vegetation on the old block cut areas and some modified vegetation at the northern extent of the site. This area also revealed signs of previous agricultural improvement through the installation of perforated pipe drainage (Photo 2).

Bliksrudmåsan has better coverage of vegetation dominated by Hare's-tail cotton grass *Eriophorum vaginatum* with frequent hummocks of sphagnum. The site however is still drained by a network of active ditches (Photo 3)

The role of Liermåsan & Bliksrudmåsan are currently being considered in the context of flood prevention by Haldenvassdraget Vannområde. A report prepared by NIBIO (2018) propose using Liermåsan & Bliksrudmåsan for floodwater storage. Presently, owing to the lowering of the surface by milling, both bogs can become inundated by floodwaters during peak flows.

PHOTO 3 NATURAL RE-VEGETATION ON BLIKSRUDMÅSAN

According to Barton *et.al* (2011), these mire systems lie within the larger Glomma-Lågen watershed. This is the largest in Norway and is part of the Glomma Water Region under Norway's implementation of the Water Framework Directive. The Region includes the Morsa and Halden watersheds, which lie to the south-west and south-east of the lower Glomma respectively. For the Haldenvassdraget watershed approximately 43% of its lakes by surface area are in poor or moderate status owing to eutrophication. This is further confirmed in a report prepared by NIBIO (2018) which state that the Haldenvassdraget catchment area has high levels of Phosphorus, most likely from runoff from surrounding agricultural land.

To maximise the ecosystem services of these bogs for their potential to aid peak flow regulation, they first must be in a good condition. As mentioned in Part 1 of this Report, heavily eroded peatlands are characterised by predominantly low water table conditions with very rapid wet-up responses followed immediately by rapid drain-down after the cessation of rainfall. While intact peatlands maintaining a high water table offer little room to store extra water, they do act as important water stores and help to maintain steady flow rates to rivers within the catchment.

Recommendations

The restoration of milled peatlands presents the greatest challenge of habitat recreation. These hostile environments are not natural and as such, few species can colonise successfully. Without intervention, milled peat sites can remain devoid of vegetation for tens of years (Quinty & Rochefort, 2003).

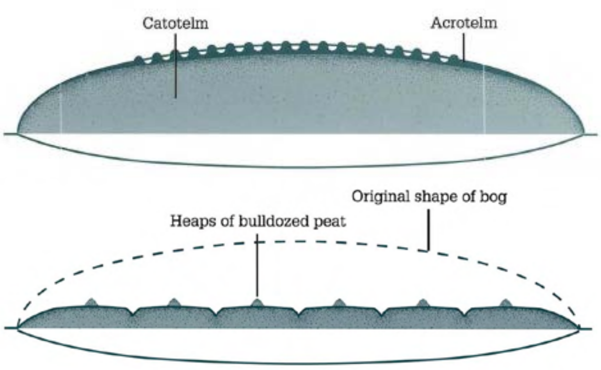


FIGURE 1 INTACT VS MILLED BOG (LINDSAY, 1995)

A functioning lowland raised bog is an ombrotrophic system and is therefore entirely rain fed and nutrient poor. It will comprise a domed landform sloping into the rand and lagg zone with the mineral interface. Milled peatland lack this landform and the active acrotelm along with some of the catotelm has been removed (Figure 1). The hydrology of this site has been severely affected.

Since most of the surface of these bogs has been milled or cut, there is limited remnant vegetation available for the provision of diaspores. Re-vegetation will therefore require the addition of donor vegetation.

The methodology for the restoration of bare peats has been a subject of much experimentation over the years. Early efforts focused on hydrology through blocking ditches and creating water bodies on the peatland. However, large water bodies are very slow to colonise with vegetation. Furthermore, when bunds overtop, large amounts of dissolved and particulate carbon can enter the nearby watercourses.

The last 20 years has seen the development of more effective bunding techniques using peat and the development of the use of donor material for revegetation. Quinty & Rochefort (2003) detail the development the Canadian approach to restoration of milled peatlands, which seeks to stabilise the water level and actively reintroduce bog plant species.

Firstly, it is necessary to stabilise the water table. Owing to the complex post milling topography, simply blocking the drains will lead to the creation of large bodies of water. The Lidar image reveals that the milling fields on the west slope down to the central drain. A large peat face separates this from the eastern fields, which also slope eastwards to the outer drain.

Considerable work is required to profile steep cut peat faces and lessen slope gradients across the site. It is also recommended that any hard-oxidised peat be removed from the surface. This can also be beneficial since vehicle tracks create surface microtopography.

The restoration of the hydrology favourable for bog vegetation will rely upon carefully designed dams and bunds. While the drains should be blocked with peat dams at regularly intervals, retention of open water between the dams provides a valuable potential habitat.

Photo 4 One of the many designs of bunds and dams

The creation of low bunds can also prevent water movement and help create a microclimate favourable for bog vegetation. They are particularly useful to retain water over a gradient. There have been many different designs used but the shape is secondary to the size and height (Photo 4). Too tall and too greater area and too much water will be held preventing colonisation. Small subtle bunds are more effective, maintaining a shallow film of water just above or at the surface.

Even with a restored hydrology, recolonisation of bog vegetation will be slow and further oxidation of the peat will occur. To protect the further loss of carbon, donor vegetation will be required.

The donor material should be obtained from a nearby source. Vålermåsan would be an ideal donor site for Liermåsan. Harvesting should aim to cut the top 10cm of the Sphagnum in long narrow strips to minimise the impact to the donor site. Cutting must minimise damage to the donor material and is likely to necessitate specialist lightweight machinery. The ratio of donor to receptor site is between 1:15 and 1:10 (Quinty & Rochefort, 2003).

Photo 5 Application of donor material with grass mulch

The Canadian approach applies the donor material with a mulch of straw for protection. A recent development in the UK uses a mulch of cut grasses and mosses from a peaty acid grassland site and mixes this with the donor material prior to application to the surface (Photo 5). The matrix of cut grasses adhere to the peat surface and provide a nutrient source for the pleurocarpus mosses to establish. The matrix maintains moisture and provides an ideal surface for the donor sphagnum to become established (Photo 6).

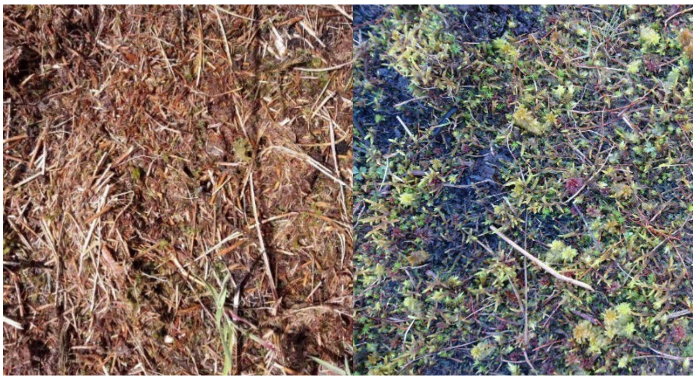


Photo 6 donor material and mulch at application, and at 1 year

Finally, it may also be necessary to retain some manged shallow swales to allow excess water to leave the site. The latter is of particular importance to prevent the permanent formation of large bodies of water, which will prevent the formation of bog vegetation. These can be manged so that the water level can be gradually increased as the vegetation becomes established.

The restoration of Bliksrudmåsan is far more straightforward since much of the site supports some pioneering bog vegetation. The methodology here would be simply to block the network of drains to maintain a stable water table within the peatland.

On completion of the above restoration, it is expected that pioneer bog vegetation will be established within 5 years. A permanent cover of vegetation will prevent further loss of peat and considerably lessen the loss of carbon. Eventually once fully established, the active bog surface will once again sequester carbon. Furthermore, the land can once again contributed to a functioning downstream flood storage solution.

References

Barton DN, Lindhjem H, Magnussen K & Holen S (2011) Valuation of Ecosystem Services from Nordic Watersheds. Norden Publications

Faktaark.naturbase.no. (2018) Naturbase [online] Available at: http://faktaark.naturbase.no [Accessed Nov. 2018].

Geo.ngu.no (2018) Løsmasser - Nasjonal løsmassedatabase [online] Available at: http://geo.ngu.no/kart/losmasse_mobil/ [Accessed Nov. 2018].

Hoydedata.no (2018). Høydedata. [online] Available at: https://hoydedata.no/LaserInnsyn [Accessed Nov. 2018].

Lindsay R (1995) The Ecology, Classification and Conservation of Ombrotrophic Mires. Scottish Natural Heritage.

Manitobapeatlands.weebly.com (2018) How peat is harvested [online] Available at: http://manitobapeatlands.weebly.com/how-is-peat-extracted.html [Accessed November 2018]

Miljostatus.no. (2018) Hjem. [online] Available at: http://www.miljostatus.no [Accessed Nov. 2018].

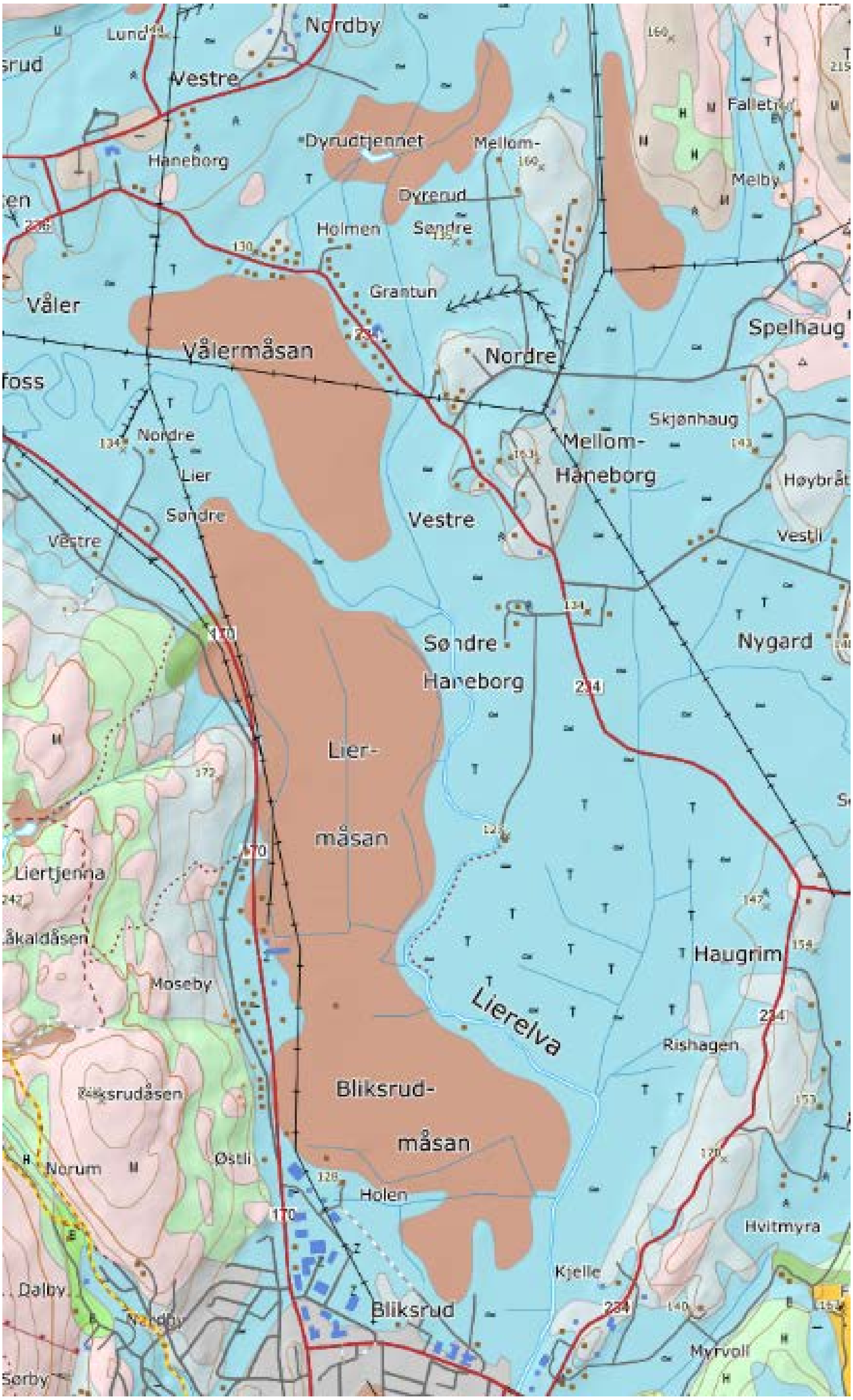
Hauge A, Barneveld R & Stolte J (2018) Flomdempingstiltak i Lierelva - En mulighet for etterbruk av Liermåsan og Bliksrudmåsan etter torvuttak. NIBIO

Norgeibilder.no (2018) [online] Available at: https://www.norgeibilder.no/ [Accessed Nov. 2018].

Quinty F & Rochefort L (2003) Peatland Restoration Guide. Canadian sphagnum Peat Moss Association & New Brunswick Department of Natural Resources and Energy

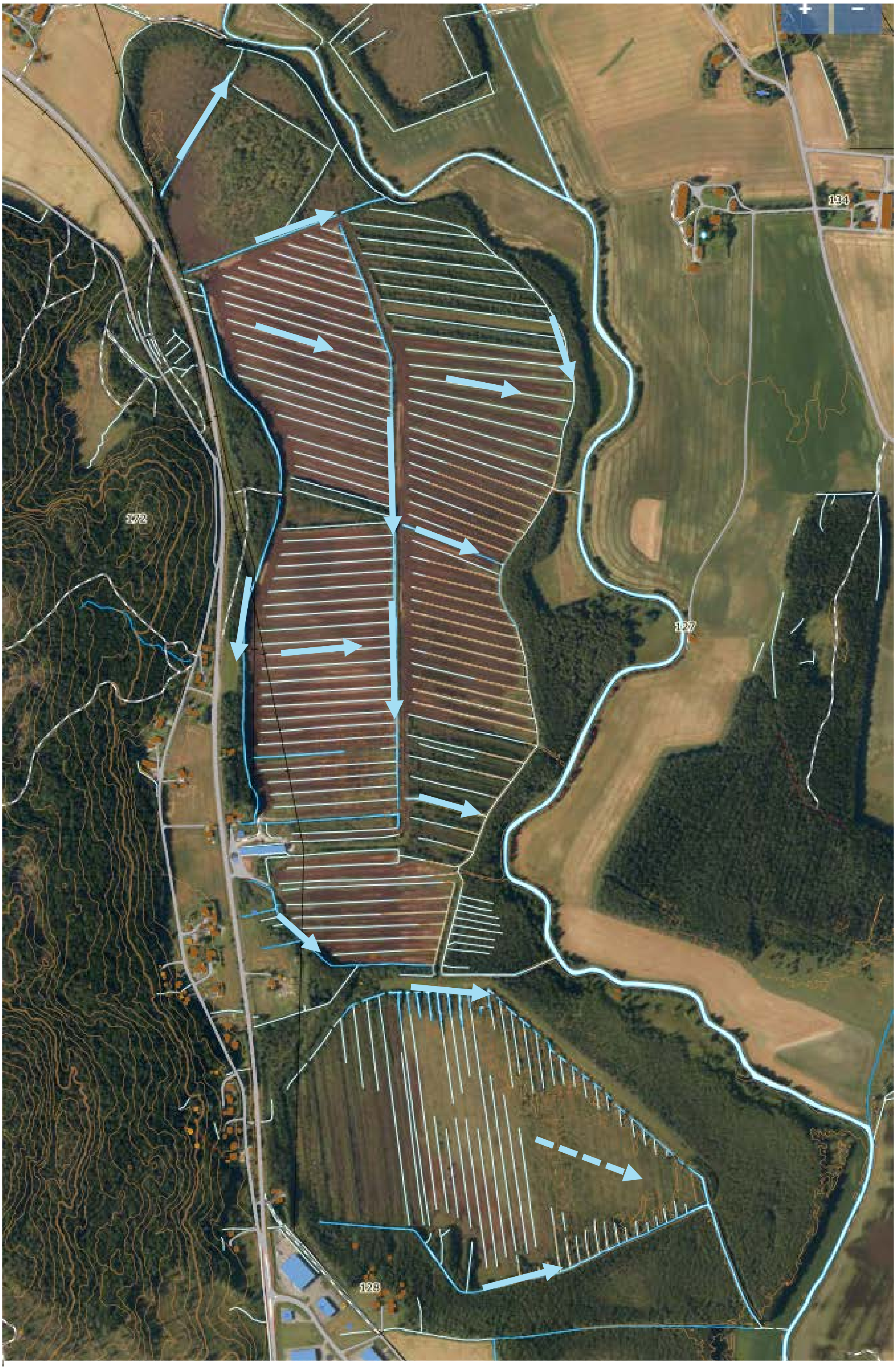
Appendix 1 - Liermåsan & Bliksrudmåsan Maps

MAP 1 MIRE MACROTOPE (NORGEIBILDER.NO, 2016)



MAP 2 PEAT EXTENT (GEO.NGU.NO, 2018)

Map 3 Historical aerial photograph (Norgeibilder.no, 1967)



MAP 4 DRAINAGE NETWORK AND DIRECTION OF FLOW (GEO.NGU.NO, 2018)

Appendix 2 - Index of plant names

English Name	Norwegian Name	*Latin Plant Name*
Bell heather	Klokkelyng	*Erica tetralix*
Bilberry	Blåbær	*Vaccinium myrtillus*
Birch	Birk	*Betula pendula*
Bog bilberry	Blokkebær	*Vaccinium uliginosum*
Bog Rosemary	Bladlyng	*Andromeda polifolia*
Cloudberry	Moltebær	*Rubus chamaemorus*
Cowberry	Tytebær	*Vaccinium vitis-idaea*
Crowberry	kråkebær	*Empetrum nigrum*
Deergrass	Småbjønnskjegg	*Trichophorum cespitosus*
Hare’s tail cotton grass	Torv Myrull	*Eriophorum vaginatum*
Ling	Lyng	*Calluna vulgaris*
Purple moorgrass	Blåtopp	*Molinia caerulea*
Scot’s Pine	Furu	*Pinus sylvestris*
White-beaked sedge	Kvitmyrak	*Rhynchospora alba*