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Abstract

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Plant distribution, phytosociology and succession have been investigated on a glaciofluvial floodplain, draining parts of the Jostedalsbreen glacier, Western Norway. The sandur is approximately 2.4 km^2 in area, and situated 500 m a.s.l. Here different successional stages from newly colonized areas to fairly stable *Alnus incana* forest are situated side by side. A total of 165 vascular plants have been recorded, and the flora is characterised by a high frequency of alpine plants. Vegetation sample plots from different parts of the sandur have been analysed, and they have been classified by two-way indicator species analysis (TWINSPAN). 15 different groups (vegetation types) have been separated, and these are discussed in terms of environmental variables, i.e. water level fluctuation, sediment type and soil chemistry, and time after exposure. The environmental factors are closely associated with the glaciofluvial processes, i.e. sedimentation and erosion.

Phytosociological data combined with environmental data from the same plots have been analysed by canonical correspondence analysis (CANOCO). On the basis of these investigations the main patterns of succession on the sandur are discussed.

Key words: Flora - vegetation - succession - sandur - Western Norway.

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Referat

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Hovedtrekkene i flora, plantesosiologi og suksesjon er undersøkt på den store aktive breelvsletten ved Fåbergstølen i Jostedalen. De østlige delene av Jostedalsbreen dreneres over denne sanduren som er ca 2,4 km^2 stor, og ligger 500 m o.h. Her finnes ulike suksesjonsstadier representert, fra nylig etablert vegetasjon til stabile gråorskoger med et tett vegetasjonsdekke side om side. Totalt er 165 ulike karplanter funnet, og floraen er karakterisert ved et sterkt innslag av fjellplanter. Det er tatt plantesosiologiske analyser spredt over hele sanduren. Analysene er klassifisert ved hjelp av dataprogrammet TWINSPAN, og de er inndelt i 15 grupper (vegetasjonsenheter). Disse blir diskutert i relasjon til økologiske parametere. De viktigste faktorene som påvirker vegetasjonen er vannfluktuasjoner, sediment-type, jordkjemi, beite og tid etter vegetasjonsetablering. De økologiske forholdene er vesentlig bestemt av prosesser knyttet til sedimentasjon og erosjon.

Det plantesosiologiske materialet, sammenstilt med opplysninger om økologiske forhold, er blitt analysert ved hjelp av dataprogrammet CANOCO. På bakgrunn av disse undersøkelsene blir hovedtrekkene i vegetasjonsutviklingen og artenes utbredelse på sanduren belyst.

Undersøkelsen er også et bidrag til å belyse den naturfaglige verneverdien til dette svært spesielle området. Sanduren ved Fåbergstølsgardane er den største aktive breelvsletten som finnes på det europeiske fastlandet, og det er derfor viktig å få bevare denne mest mulig intakt også i framtida.

Emneord: Flora - vegetasjon - suksesjon - sandur - Vest-Norge.

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Preface

In connection with the plans for hydroelectric development in the Jostedal glacier area (Breheimen), staff at the Botanical Institute, University of Bergen, carried out botanical investigations during the summer 1982 (Blom et al. 1982). It was planned to build a dam (ca. 50 m high) at the outfarm Fåbergstølen, which would dam a big sandur (Fåbergstølsgrandane).

The botanical investigations were part of a multidisciplinary project in which geological, zoological, and climatological investigations were carried out. The main aim of the project was to describe the nature of this sandur, and to evaluate the importance of its protection.

It was concluded after these investigations (Anda et al. 1982, Fjellheim & Raddum 1982, Blom et al. 1982) that the sandur represented a unique ecosystem with a high scientific value.

In 1985 the Norwegian Government gave concent to regulation of the Jostedøla river for hydroelectric purposes, but the construction of the planned dam at Fåbergstølen was rejected. Accordingly, the sandur has not been dammed, but the southern part will be disturbed because one of the tributary rivers, Sprongdøla, running over the sandur has been allowed regulated. Today the sandur is included within the planned Jostedal Glacier National Park.

In order to study the effects of the regulations, a 3-year project was started in 1985 (Odland et al. 1989).

The results of the botanical investigations carried out on the sandur in 1982 were not published satisfactorily, only one preliminary report being submitted to the employer. During 1983-88 additional data were collected, and all available data have been included in this report.

The publication of this report has been financially supported by STATKRAFT.

The English text has been revised by Sylvia Peglar.

Bergen, June 1990

Arvid Odland,
project leader

Contents

1 Introduction

Glaciers influence their sourroundings in many ways, both directly and indirectly. One of the most interesting features from a ecological point of view is the formation of different glacial landscapes and ecosystems. Glaciers are very sensitive to climatological fluctuations, and their sizes are therefore variable. Several glacier fluctuations over the last few centuries have been investigated. Since the postglacial maximum c. 1750 AD there have been at least 10 minor glacier advances (Matthews 1977). During the last 50 years there has been a continous glacier retreat. As a result, great areas of bare land have been exposed. Some of these glacier forelands have been investigated (Fægri 1933, Matthews 1977, Elven 1978, Matthews et al. 1979, Vetaas 1986).

Another type of glacial landscape is glaciofluvial floodplains or sandurs. These are developed by the outwash of sediments from the glacial activity. Sandurs which are influenced by rivers of glacial origin have a very dynamic and variable surface (Prince 1971).

Such sandurs were widely distributed during the deglaciation (Andersen 1960), but as most of the glaciers disappeared, these became inactive and a stable vegetation was developed. Today most of these are cultivated.

The sandur at Fåbergstølen in Jostedal is the largest still active sandur on mainland Europe. The northern part of the Jostedal glacier is drained through rivers crossing this sandur. Erosion and sedimentation are therefore important processes during the summer. This leads to a very dynamic vegetation on the floodplain. All succession stages from newly colonized areas to stable forest types occur side by side, and in many cases their intermediate stages are also represented.

Van Cleve et al. (1971: 111) studying a braided floodplain of the Tanana River in the interior of Alaska, states: "- a major river of glacial origin provides an excellent opportunity to study many aspects of ecosystem succession in the taiga. Continual deposition of fresh alluvium by the heavily silt-laden river provides new sand and silt surfaces for plant colonization."

The main aims of the present paper are: 1) to give a survey of the floristic composition and distribution of vascular plants on the sandur, 2) to describe the plant communities and to relate these to environmental factors, 3) to discuss the main patterns of vegetation succession, and 4) thereby to point out the scientific value and need for protection of this sandur.

2 Investigated area

The investigated sandur is situated within the Jostedal river catchment. This valley lies in the eastern part of the Sognefjord area, cf. **Figure 1**. The river Jostedøla runs in a southerly direction from the Jostedal glacier, the largest ice cap on Mainland Europe. The river is approximately 60 km long, and the catchment is 861 km^2. Only 1.7 % of the catchment area is covered by lakes, while 27.3 % is covered by ice. Jostedøla drains the main southern part of the Jostedalen glacier. Jostedalen is a narrow, U-shaped valley surrounded by high mountains, over 1600 m high.

The sandur is situated 500-550 m a.s.l., some 40 km from the fjord, in the transition zone between the middle and upper oroboreal zones. The vegetation in the immediate surroundings is mainly fern-dominated birch (*Betula pubescens*) forest (Odland et al. 1989).

The bedrock consists of acid gneisses (Harsten 1979:8). Mica shists occur only in the southeastern mountain areas.

The climate of Jostedalen represents a somewhat subdued coastal climate with a precipitation maximum during late autumn or early winter. The inner parts of Sognefjord have a more continental climate than the rest of Western Norway, with cold winters and warm summers (Laaksonen 1979). The precipitation rate in Jostedalen is, however, higher than in the rest of this area: probably an effect of the glacier. Mean precipitation during the year at altitudes around 350 m a.s.l. is approximately 1200 mm, increasing considerably towards the glacier.

2.1 The sandur Fåbergstølsgrandane

A characteristic landform of glacially influenced valleys is the occurrence of outwash plains, or sandurs. Some, such as Fåbergstølsgrandane, have developed as the glacier or ice-sheet melted. The drainage water carries great amount of morainic material. This outwash material may be deposited downvalley when there is a decrease in depth and velocity of flow as the stream spreads laterally. The fluvio-glacial material may consist of material of all sizes, from large stones to silt and clay. Stones and coarse material are deposited nearest the glacier (the northern part) and silt and clay at a greater distance (the southern part). The sandur rivers are characterised by successive branching and rejoining of stream channels between islands and bars of alluvial material. The rivers frequently overtop their floodplain and erode new channels. Thus, an active sandur such as Fåbergstølsgrandane is a very dynamic system where there is a continual change in water level and rate of deposition and erosion.

Fåbergstølsgrandane is 5 km long and 500-800 m broad, with a total area of some 2.6 km^2 (**Figure 2**). The vertical gradient is 1 % in its southern part and 30 % in the north. **Figure 3** is a transect showing this vertical gradient. A major part of the glaciofluvial material deposited on the sandur comes from the Steghol and Lodal glaciers north of the floodplain. The river Sprongdøla from the east has a greater flow of water, but does not carry much suspended material. Only small amounts of material are transported beyond the lakes Kupevatn and Austdalsvatn which function as sedimentary traps.

The rivers from the Steghol and Lodal glaciers carry large amounts of material to the sandur each year, half being bottom material and half in suspension. Most of the bottom material is deposited in the proximal part of the sandur, while the sediments in suspension are transported across the sandur, down the Jostedal valley, and deposited in the Gaupne Fjord (Relling & Nordseth 1979, Harsten 1979, Huseby & Faugli 1986). Some of the silt and clay is, however, deposited in backwaters and in the vegetation on the floodplain during periods of flow.

2.2 Hydrology

Jostedøla, like other glacially influenced rivers, is characterised by a variable run-off, a heavy sediment load, rapid shifting of the coarser heterogenous bottom material and a high rate of bank erosion. Annual hydrographs and mean monthly run-off closely correspond to the glacier's mass budget, and almost 90 % of annual run-off is discharged during the summer months. The impact of glacial ablation is evident from the often distinct diurnal periodicity of the run-off, maximum at Stegagjerde between 2200-2400 hrs., and a minimum at c. 1200 hrs. Mean annual run-off is shown in **Figure 4**.

2.3 Hydrology and water level fluctuations on the sandur

The variable run-off regime in Jostedøla determines the water level fluctuations on the sandur. In addition to the amount of water, the shape of the riverbeds and the sandur outlet also effect the water fluctuations. Over most of the sandur, the river beds are branching and wide, and a moderate increase in run-off has little effect on the water-level. But at the sandur outlet, the river branches rejoin and run through 2 narrow channels. Increased run-off results in much higher water levels above these channels than in the rest of the sandur. In order to investigate the water level fluctuations on the sandur, 5 watermarks have been established, see **Figure 2**. The water-levels at these are correlated with the permanent water gauges in Jostedøla.

During July-August 1985 the difference in water-level was 80 cm in the southern part of the sandur, decreasing to approximately 20 cm 500 m north of the outlet (Odland et al. 1989), see **Figure 5**.

2.4 Sediment load

The transport of suspended material in the Jostedalen river was investigated by Harsten (1979), Huseby & Faugli (1986) and Huseby (1990). At the outlet of the sandur, the amount of suspended material during June-October 1986 was 69,345 tons. During 1986-87 the amount of organic matter in the suspended material was between 2 and 4 % at the sandur outlet (Huseby 1990). One may assume that most of the organic material develops on the sandur, and is transported due to erosion by the glacial rivers. The measurements indicate considerable variation in the quantities of suspended material being transported throughout the year and from day to night. The quantity carried is well correlated with the the amount of run-off, and highest values are found two hours earlier than the maximum run-off. During the year the difference in concentrations of suspended sediment is due to snowmelt and glaciermelt conditions. The concentration of sediment load is highest in late summer during the glaciermelt period.

Sediment load in the river water at the outlet is variable. In 1985 the highest measured value was 1337 mg/l. The maximum concentration was probably even higher (Huseby & Faugli 1986). The particle size of the suspended material was also very variable, and in general closely related to run-off. At high run-off, the particles were mostly fine-graded, with a high portion of clay (the majority of the particles were less than 125 um). The main sources of suspended material are the Lodal and Steghol rivers. The Sprongdalen river has a much lower sediment load, altough it represents half of the discharge at the sandur outlet.

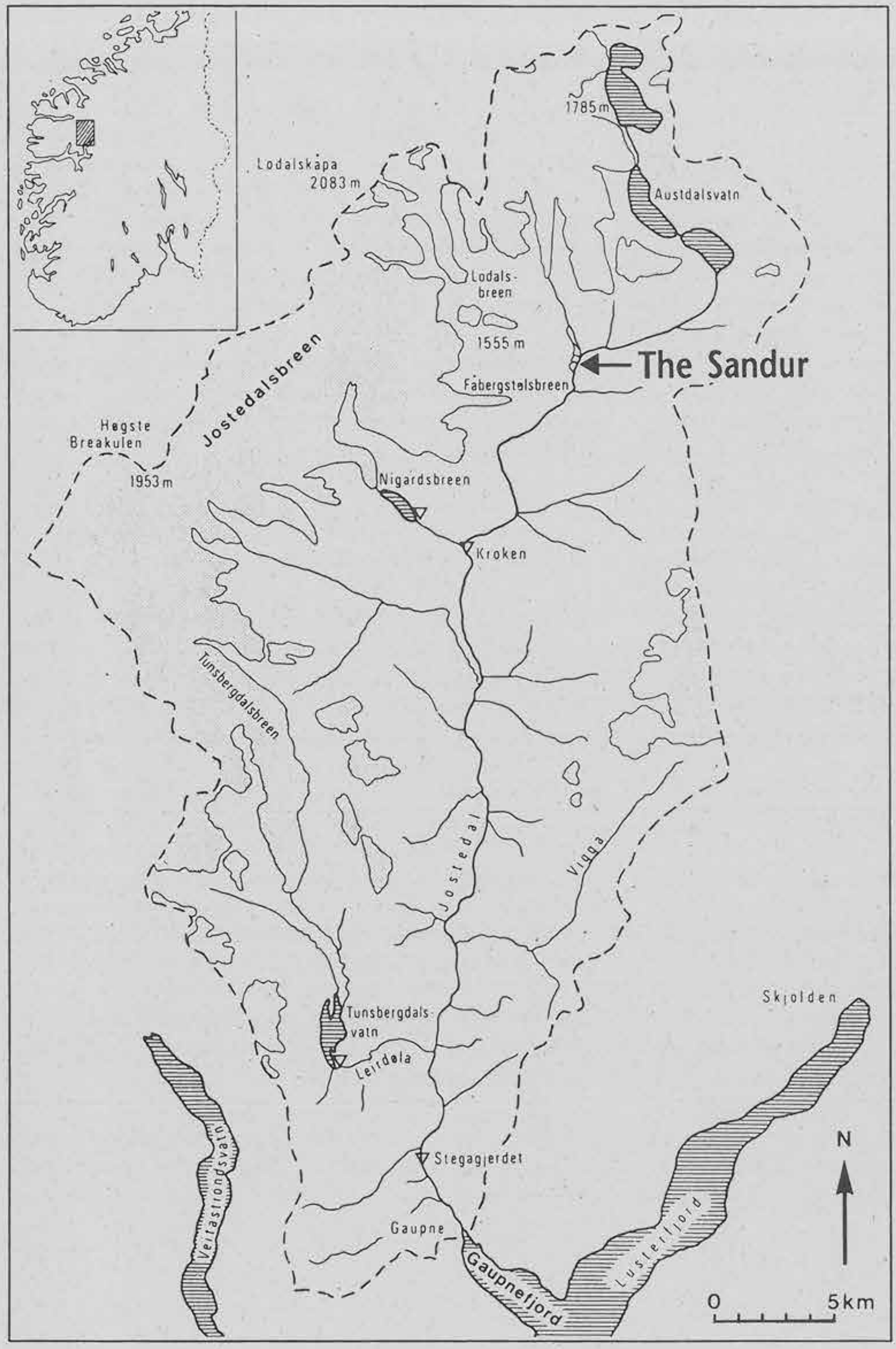


Figure 1
The Jostedalen river catchment with the sandur Fåbergstølsgrandane. (Relling & Nordseth 1979). - Jostedølas nedbørsfelt med sanduren Fåbergstølsgrandane.

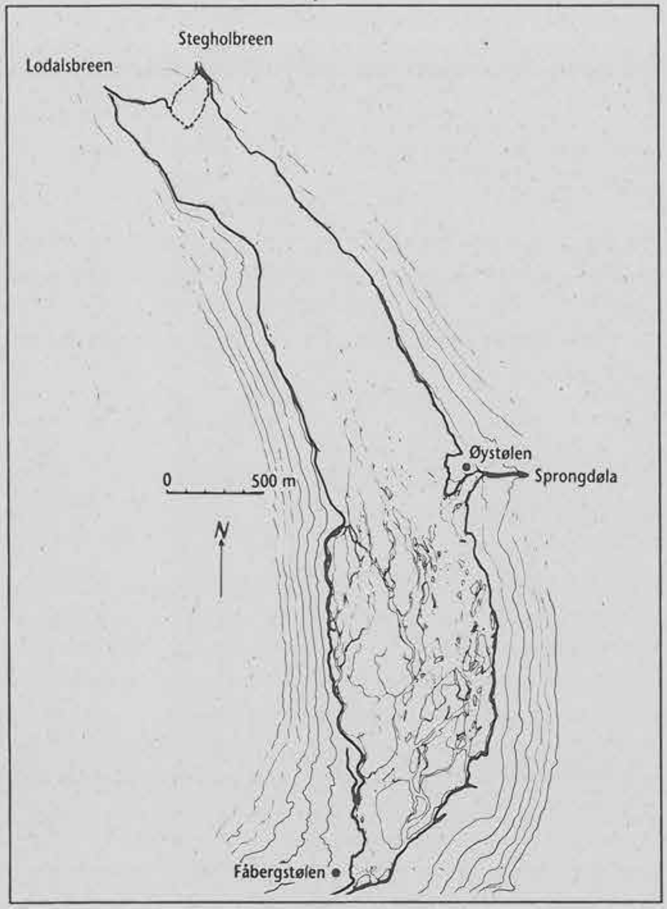


Figure 2
The sandur, situation based on aerial photo from 1979. - Kart over sanduren basert på flyfoto fra 1979.

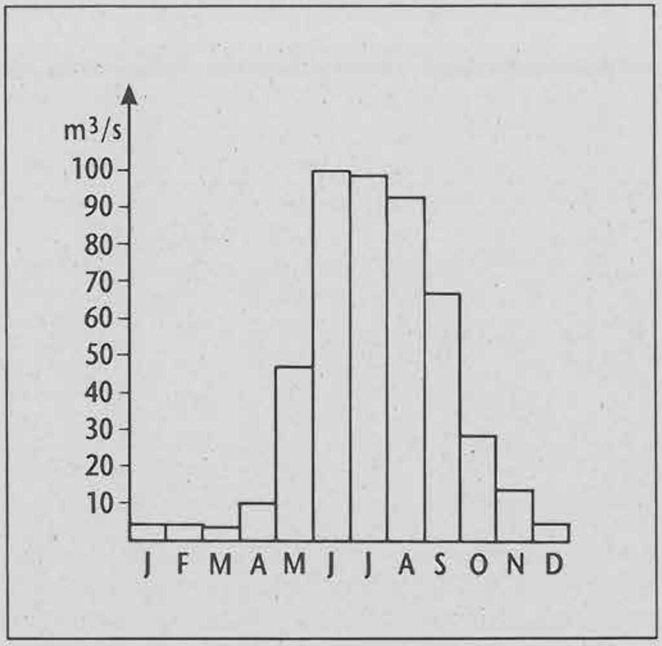


Figure 4
Mean run-off at the Haukåsgjelet water-gauge. - Avløpet i Jostedøla ved Haukåsgjelet (Husebye 1989:23).

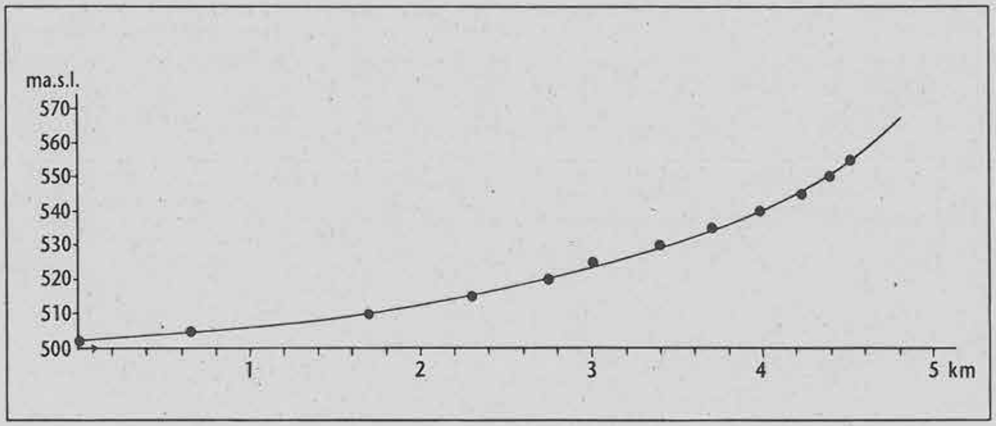


Figure 3
Vertical transect of the sandur showing its vertical gradient. - Transekt som viser den vertikale gradienten på sanduren.

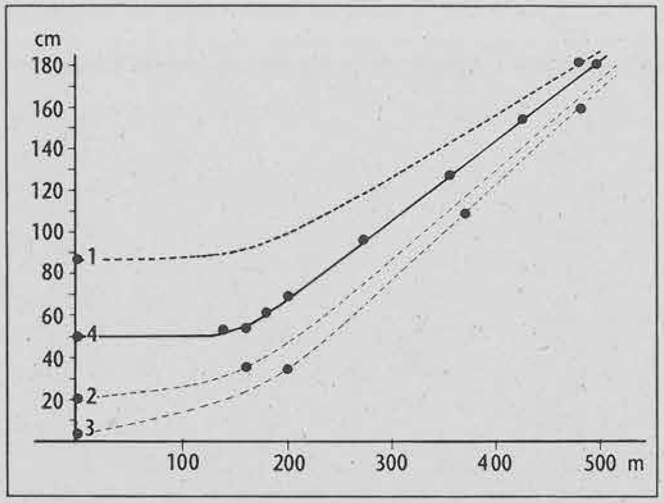


Figure 5
Water-level fluctuations at the southernmost 500 m of the sandur during 1985. 1 indicates the heighest and 3 the lowest water-level. 2 indicates mean water-level for the period June-August, and 4 the lower distribution limit for Pohlia filum *(with sporophytes). - Vannfluktuasjonen i de sørlige delene av sanduren sommeren 1985. 1 viser høyeste, 2 midlere og 3 aveste vannstand. 4 angir nedre utbredelsesgrense for mosen* Pohlia filum *(med sporofytt).*

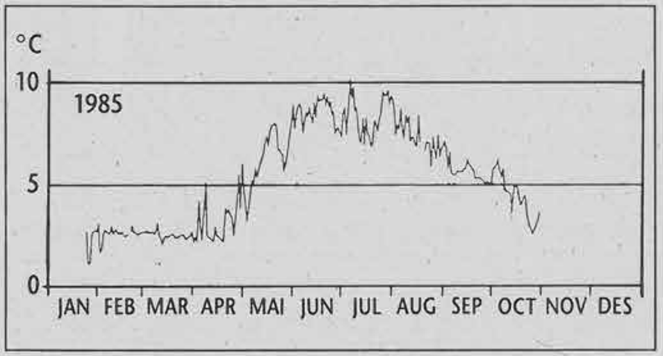


Figure 6
Water temperatures in the Jostedalen river at Gaupne in 1985. (Pytte Asvall 1987). - Vanntemperaturer i Jostedøla ved Gaupne i 1985.

2.5 Water temperature

The water temperature during spring-autumn is usually between 3 and 10 °C at the outlet of the sandur (Fjellheim & Raddum 1982, Utaaker 1987). In the northern part, the water temperature is even lower. The water from the glacial rivers may be below 2 °C even in June (**Figure 6**). In backwaters the temperature may, however, be increased to almost 20 °C during warm periods. The prevailing very cold water undoubtly effects both plant establishment and vegetational zonation on the sandur.

The conductivity of the water (H 20) during 1982 varied between 5 and 25 µS cm (Fjellheim & Raddum 1982). These values indicate low rates of nutrient content. pH in the northern rivers lies between 6.15 and 6.70, but Sprongdøla has lower values of 4.8-5.95.

2.6 Air temperature on the sandur

The temperature on the surface of the sandur is very unfavourable taking its altitudinal position into account. Climatological investigations (Utaaker 1987) have shown that summer mean temperatures are 1-2 °C colder than one would expect from its altitude (**Figure 7**). In particular, the difference was most significant in respect to the minimum temperatures, while the variation from "normal conditions" in maximum temperatures were smaller. The difference in temperatures between 200 and 30 cm above the ground was also significant. Normally the temperatures at 30 cm above ground are 1-7 °C higher than those at 200 cm during the daytime. At the sandur there were only small differences between the temperatures at different heights.

The unfavourable temperature conditions are probably due to cold air flow from the glaciers north of the floodplain, and to the cold river water. There are also some ecological/climatological differences between the two sides of the sandur. Parts of the western side are generally free from snow cover later than the eastern side.

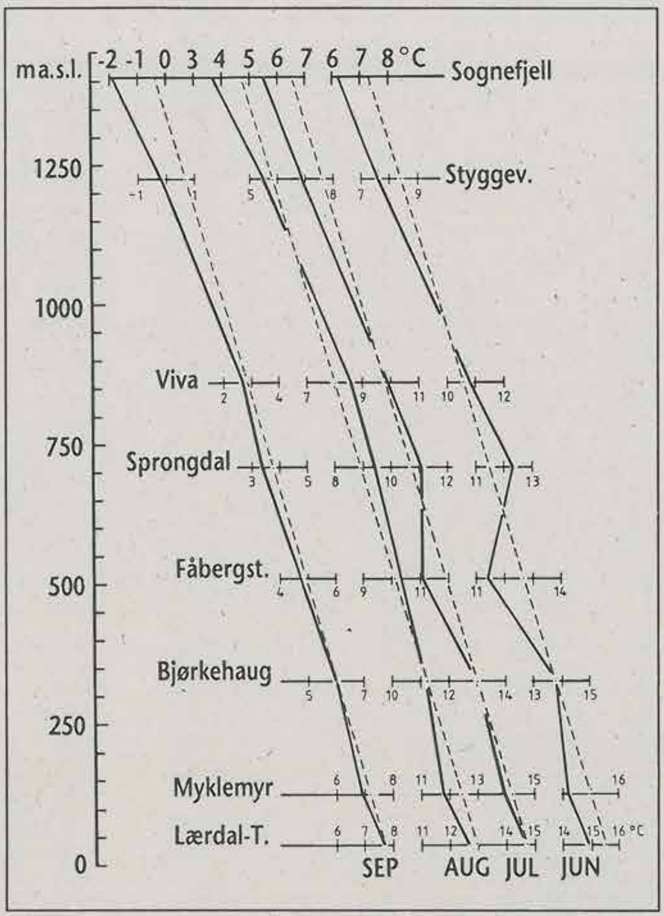


Figure 7
Monthly mean temperatures during June-September 1986 at the sandur compared to other stations in Sogn, based on a 0.6 °C/100 m lapse rate (Utaaker 1986). - Middeltemperaturer i perioden juni-september 1986 sammenlignet med andre stasjoner i Sogn basert på en generell 0,6 °C senkning av temperaturen for hver 100 m økning av høyden.

2.7 Main pattern of vegetation

In 1982 about half of the sandur had a vegetation cover, the rest being gravel, sand, silt and water. Physiognomically the vegetation could be divided into cryptogamic communities, *Salix* spp. shrubs, and *Alnus incana* forests. These covered respectively 29 %, 16 %, and 13 % of the total sandur area (cf. **Figure 8**). The grey alder forests dominated the southern part, gradually decreasing to approximately 2 km north of the outlet. The willow shrub dominated the middle part, most often in a mosaic with cryptogamic communities. The northern half of the sandur had mainly bare coarse sediments and river channels.

2.8 Cultural influence

At the outfarms, cultural influence has been traced back to approximately 900 years B.C. (Kvamme 1982), and the sandur area has probably been used for grazing since then. Animals, mostly cows, have been grazing until recently, mainly on the southwesternly parts of the area which are easily accessible. To reach the eastern parts of the sandur the main river has to be crossed. This has had a pronounced effect on the vegetation preventing *Alnus incana* and *Salix* spp. becoming established in the southernmost parts.

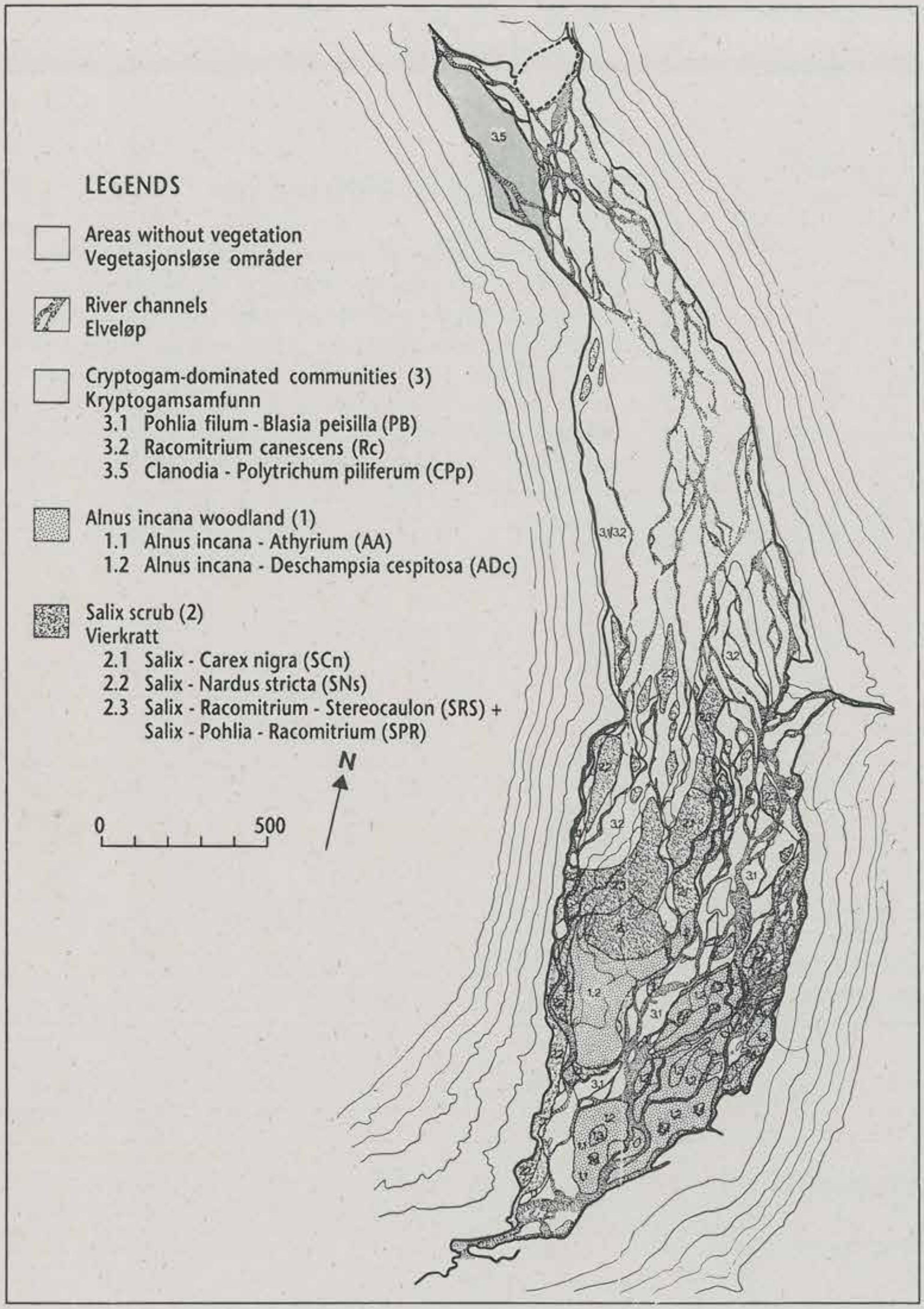


Figure 8 *Vegetation map of the sandur showing the situation in 1982. - Vegetasjonskart over sanduren basert på forholdene sommeren 1982.*

3 Methods

This investigation is based on phytosociological analyses of homogenous vegetation stands, located across the whole area of the sandur. Quadrat size varies according to vegetation type: 1 m^2 quadrats were used for cryptogamic communities, 4 m^2 for shrub communities and 25 m^2 for forest communities. Plant species cover was estimated according to the Hult-Sernander-DuRietz scale.

In the transect descriptions the vegetation has been divided into more or less homogenous zones situated at different distances from the river bank.

In some of the quadrats the actual height above normal water-level has been measured by a levelling instrument. In order to get comparative data, all heights have been transformed into height above the water-level at 27.7.1985, 1700 pm, which is close to the mean July water-level at the Kroken water-gauge.

Some of the species have caused taxonomical problems. *Salix phylicifolia* and *S. nigricans* have often been impossible to separate during fieldwork, partly because both hybrids and juvenile plants are common. Therefore these have all been named *S. nigricans*.

Both *Racomitrium canescens* var. *latifolium* and *R. ericoides* (Frisvoll 1983) are very common on the sandur. These have not always been separated during fieldwork, and have in many cases been named *R. canescens* coll. The cryptogams are numerous and often difficult to identify, especially in pioneer communities. In most cases only the most common have been identified, liverworts sometimes only to genera. Total cover of hepatics (*Blasia pusilla* and *Marchantia alpestris* excluded), including both identified and unindentified species, are named Hepaticae spp. and given a total cover value.

From some of the quadrats soil samples were taken for grain size, loss-on-ignition, and chemical analyses. Soil samples were taken from different layers within sediment profiles from the analysed quadrats.

For comparative studies only samples from the uppermost 0-10 cm are used.

The soil samples were passed through sieves with an aperture of 2.0 mm before further analysis. pH was measured by a digital pH-meter on 25 g of soil shaken for two hours in 50 ml diionized water. Before loss-on-ignition determination, soil was dried at 105 ^{o}C for 24 hours. Loss-on-ignition is presented as a percentage of the weight of dry soil, after all humus was removed by about 3-4 hours ignition at 550 ^{o}C.

For cation analysis 25 g of soil was shaken in 100 ml of 1 molar ammonium acetate with pH 7.0 for 2 hours and then filtered. K and Na were measured with a flame photometer, and Mg and Ca with an atomic absorption spectrophotometer. Cation concentrations are quoted as mg/100 g dry soil. Base saturation is given as the amount of K, Na, Mg, and Ca as a percentage of the total amount of these cations plus H. Cation exchange capacity is the sum of K, Na, Mg, Ca and H and is expressed as me/ 100 g dry soil.

Particle composition in the sediments was investigated in different sample quadrats, both in the surface layer and at different levels in sediment profiles. The samples were shaken through sieves with different apertures sizes:
19 mm, 16 mm, 8 mm, 4 mm, 2mm, 1 mm, 500 µm, 250 µm, 125 µm.

The amount within each size category is given as the percentage of the weight of the total sample.

In order to obtain some information about standing crop and organic production of the sandur vegetation, the amount of organic material in different vegetation types, and different layers was measured. Only material above the ground was investigated.

After finishing the sociological analyses all the plant matter in several plots (1 m^2) was collected and sorted into four groups: bottom layer (mainly mosses), field layer (grasses, herbs and ferns) shrub layer (mainly willows), and tree layer (mainly *Alnus incana*).

The moss standing crop was measured as the difference in weight before and after ignition of the dried sample material. In this way both dead and living material are included in the value.

The shrub layer and field layer standing crop were measured by weighing the total amount of dried organic matter within a 1 m^2 sample plot.

The forest standing crop was measured by cutting a typical tree within the actual stand, and estimating the total amount of dry organic matter. The number of trees in the stand was counted, and the tree standing crop within a 1 m^2 quadrat calculated.

4 Flora

4.1 Vascular plants

A total of 165 vascular plant species were recorded at the sandur (**Table 1**). The sandur was divided into 16 areas (**Figure 9**) and the frequency of the species within each of the subareas estimated on a 1-4 scale: 1 = rare, 2 = sparse, 3 = common, and 4 = dominant species. Taking into consideration that 429 species have been recorded within the whole Jostedøla catchment (Odland et al. 1989), the floristic diversity of this area (approximately 2.5 km^2) is quite high. According to these Figures 38.5 % of the vascular plant flora within the catchment is represented on 0.4 % of the area (glaciers excluded).

Quite a few of the vascular plants recorded could be considered rare, but it is the mixture of forest and high-alpine plants growing side by side which is exceptional.

Table 2 is a list of the 32 most frequent species in the analysed quadrats from the sandur. This calculation was performed by the program VEGSUM (Charleton 1986). Among these are six bryophytes. Nine of the vascular plants have an alpine distribution, while the rest are plants widespread in Norway.

Three of the species may be considered rare in Western Norway. *Salix glandulifera* has been recorded from Jostedal north to Finnmark and also from Jølster (Befring 1981: 32). Apart from these records, the species is rare in southern Norway. On the sandur it is very common, especially in pioneer communities on coarse and dry sediments. *S. glandulifera* is also common in delta vegetation in N. Sweden (Dahlskog 1982b).

Trisetum spicatum is an alpine plant mainly restricted to exposed ridges in the mid-alpine region. It has an eastern distribution in Norway, with only a few records from the interior of Western Norway. Within the Jostedøla catchment it has been recorded from moraine ridges close to the lake Austdalsvatn (Odland et al. 1989), but this locality is now inundated. On the sandur it is rare, and only recorded from the northern part.

Myricaria germanica also has a northeastern distribution in Norway. In Western Norway it has only been recorded from a few localities in the inner fjord districts. In 1988 it was found on the sandur for the first time. This was a small shrub, probably 3-4 years old, growing on coarse sediments in the central part of the sandur. According to its ecology in other parts of Norway (Skogen 1972, Klokk 1980, Fremstad 1981, 1985), the sandur should represent a suitable site for it. It is probable that temperature conditions are unfavourable for its growth here.

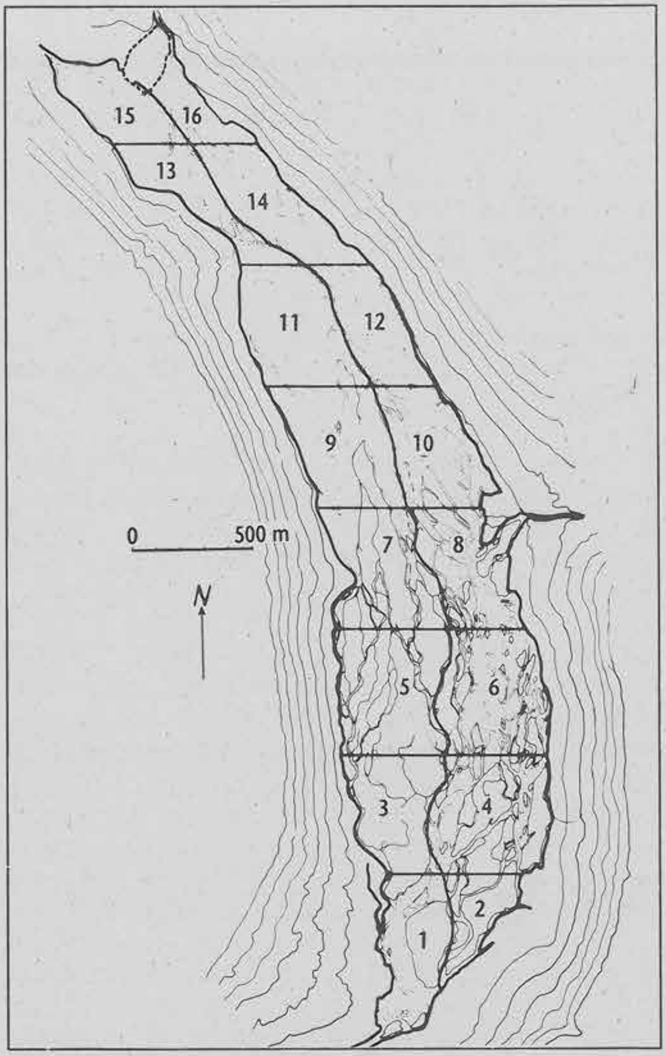


Figure 9
Areas on the sandur in which the vascular plant flora have been recorded, cf. Table 1. - Delområder på sanduren hvor karplantefloraen er registrert, jf. tabell 1.

4.2 Plant geography

None of the typical coast plants (Fægri 1960) have been recorded on the sandur. In other parts of Jostedal and in the valley sides surrounding the sandur, *Blechnum spicant* and *Thelypteris limbosperma* are common. These are, however, favoured by a well developed humus layer which has not been developed on the sandur.

Southern, thermophilous plants are absent due to the unfavourable climate on the floodplain. Several plants belonging to this element have been recorded from Jostedal, but they are mainly restricted to southfacing sites.

The continental, eastern element is represented by *Aconitum septentrionale*, *Carex vesicaria* and *Myricaria germanica*. *A. septentrionale* is very common in other parts of the Jostedal valley, but on the sandur it is very scarce. Only a few specimens have been recorded in the southern part of the *Alnus incana* forests.

The alpine plants are both quantitatively and qualitatively most important. 52 of the plants may be classified as alpine species (**Table 1**), and represent 30 % of the total number of vascular plants recorded.

Most of the alpine plants are common, but some have a more eastern distribution being quite rare in Western Norway - these include:

Trisetum spicatum
Pedicularis lapponica
Salix glandulifera
Vahlodea atropurpurea
Sparganium hyperboreum
Stellaria calycantha
Corallorhiza trifida
Eriophorum scheuchzeri

These are quite rare on the sandur, except for *Salix glandulifera* and *Eriophorum scheuchzeri*.

4.3 Plant ecology groups

The vascular plants may be divided into 8 different groups according to their main ecological affinity (see **Table 1**). The number of species within each group is indicated in brackets.

W = plants growing in or close to water. (13)
M = plants mainly growing in mires. (12)
H = plants usually found on a typical podzol profile with a raw humus layer, i.e. in heath communities of forests within the Corno-Betuletum community (Aune 1973) or low alpine heath within the Phyllodoco-Vaccinion myrtilli (Nordhagen 1943). (10)
B = plants usually found on a brown earth soil profile, i.e. typical plants within Melico-Betuletum (Aune 1973), Alno-Padion (Fremstad 1979, Odland 1981) or Lactucion alpinae (Nordhagen 1943). (33)
AS = plants characteristic of snow-bed communities (Nordhagen 1943, Gjærevoll 1956). (15)
AH = plants mainly growing in low- and mid-alpine exposed heaths, typical for the Loiseleurio-Arctostaphylion and Juncion trifidi-communities (Nordhagen 1943). (17)
C = plants favoured by cultural influence. (10)
Ca = plants usually found on soils rich in calcium. (4)

The aquatic flora is scarce considering that this is an area with much water. This is probably due to temperature conditions and the sparcity of organic matter within the rivers and ponds.

Most of the typical mire plants are rare, but some are very common. *Carex canescens*, *C. nigra*, *Eriophorum angustifolium*, *Juncus filiformis*, *Pinguicula vulgaris*, and *Viola palustris* are dominants in the southern part of the sandur.

The typical humus plants are poorly represented, and their frequency is low. Only *Vaccinium myrtillus* is fairly common over most of the sandur, but as scattered plants.

There is a surprisingly high number of species within group B. Apart from *Alnus incana* most of these species are, however, scarce and restricted to the southern part of the area. Here they are found in the most stabilized part of the grey alder forests.

Alpine snow-bed and heath plants are well represented, and many of them are very common. Their main distribution is in the middle and northern parts of the sandur, where the pioneer communities and early succession stages are most common. Species such as *Carex rufina*, *Saxifraga rivularis*, *Trisetum spicatum*, *Luzula arcuata*, *Epilobium anagallidifolium*, and *Carex lachenalii* are here found far below their normal growth elevation.

Species favoured by human influence are frequent in the southern part, especially *Ranunculus acris*, *R. repens*, and *Poa annua*. *Deschampsia cespitosa*, and *Nardus stricta* are often considered typical cultural indicators. According to their distribution on the sandur one may assume that they are here growing in natural habitats. *Deschampsia cespitosa* is dominant in sites which have never been grazed, and it is one of the first plants to establish on newly exposed sediments (cf. Fremstad 1985). *Nardus stricta* on the other hand, is a late invader, and restricted to the most stable sites on the sandur.

Calciphilous species are, of course, very rare, and only a few scattered plants have been found. *Poa alpina*, mainly var. *vivipara* is however, surprisingly common. It is always growing along streams, on newly deposited sediments where the pH is quite high.

***Table 1** Vascular plant frequency in the different areas on the sandur according to Figure 9. Their affinity to the different ecological groups are indicated. - Registrerte karplantearter på sanduren og deres utbredelse i de 16 delområdene (se figur 9). Artenes tilhørighet i "økologiske grupper" er angitt.*

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	Ecol. group
Aconitum septentrionale	1																B
Agrostis canina									2								
Agrostis capillaris	3	2	2	2	2	1	2	1	1								
Agrostis mertensii	3	3	3	4	3	4	3	4	4	3	3	3	3	3	3	3	
Agrostis stolonifera	2	2				2		1								2	V
Alchemilla alpina	2		1		1	2	2		1								
Alnus incana	4	4	4	4	4	4	2	2	2	2	2	2		2		3	B
Alopecurus geniculatus	1																V
Andromeda polifolia	1																M
Angelica archangelica	2	2		1				1									B
Angelica sylvestris	2	2	2	2			1										B
Anthoxanthum odoratum	2		2	2	1	2	2	2	1						2	1	
Arctostaphylos alpinus							1										AH
Arctostaphylos uva-ursi															1		AH
Athyrium distentifolium	4	2		2							1				1	1	B
Athyrium filix-femina	4	3		3													B
Bartsia alpina	2		2	2	1	2	2	2	2		2				3		
Betula nana			1														H
Betula pubescens	3	3	3	4	2	4	3	2	3	2	3	2	3	2	4	3	
Calamagrostis purpurea	3	3		3		3	1	1		2	1	2				2	B
Callitriche palustris	1																V
Calluna vulgaris	2		2		2	1	2		2		1				2		AH
Cardamine bellidifolia					1	1											AS
Carex atrata				1		1					1		1		1		Ca
Carex brunnescens	3	2	2	1		2	1		2			1		1	2	3	AH
C. brunnescens vitilis	1	1															V
Carex canescens	2	3	4	3	2	2		2		1						1	M
Carex echinata	3		2														M
Carex juncella	2	3		2		1			1								V
Carex lachenalii					1	1	1					1					AS
Carex magellanica						1											M
Carex nigra	4	4	4	4	4	4	2		2		2				2	2	M
Carex pallescens	2																B
Carex rostrata	4	4	4	3	3	4			1								V
Carex rufina	2				2	1	1										AS
Carex vesicaria				1													V
Cerastium alpinum							1				1	1	1	1			AH
Cerastium cerastioides	2	2	1	2	2	2	2	2	3	2	2	2	2	3			AS
Cerastium fontanum	1	1		1		1	1										C

continue

***Table 1** continue*

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	Ecol. group
Cicerbita alpina	2	2		2	1	1											B
Corallorhiza trifida	3	2	2	2	1	2	1		1								
Crepis paludosa		1															B
Cryptogramma crispa															1	1	AS
Dactylorhiza fuchsii				1	1												B
Dactylorhiza maculata	2	1	2												1		M
Deschampsia alpina	2	2	1	1	2	2	2	3	4	2	3	3	2	3		3	AS
Deschampsia cespitosa	4	4	4	4	3	4	3	3	3	3	2	2	3	3	3	3	
Deschampsia flexuosa	3		2	1	1	1	2	1	2		2				3	2	
Diphasium alpinum					1												AH
Dryopteris carthusiana	2		1														
Dryopteris expansa	3	2		2		1											
Empetrum hermaphroditum	3		3		2	3	2	2	2		1				3	1	H
Epilobium alsinifolium		1					1	1	2	1	2	3					V
Epilobium anagallidifolium	2	2	1		2	2	1	2	2	1	2						AS
Epilobium angustifolium				1							1						B
Epilobium hornemannii	2																B
Epilobium lactiflorum		1							1		1		1				B
Epilobium palustre	1																M
Equisetum arvense	4	4	3	4	3	3	2	1	2	2	2			1			
Equisetum fluviatile				2													V
Equisetum sylvaticum	4	3		3													B
Eriophorum angustifolium	3	3	4	2	4	3	3	2	1								M
Eriophorum scheuchzeri	2		2	2	1	2	2	1	2		1						AS
Euphrasia frigida	2		1		2	1											
Festuca ovina									1								AH
Festuca vivipara			1		1	1	1	1	1		1		2	2	2	2	
Geranium sylvaticum	2	2															B
Geum rivale	2																B
Gnaphalium norvegicum	3	2	2	2	1	2	2	1	2		2		2		1		B
Gnaphalium supinum	2		1		2	1	2										AS
Gymnadenia conopsea			1														B
Gymnocarpium dryopteris	2	1														1	
Hieracium spp.	2			1	1	1			1		1				2		
Hippuris vulgaris	1																V
Huperzia selago			1		1	1											AH
Juncus alpinoarticulatus	4	2		2		1			2								
Juncus articulatus	2		1														V
Juncus filiformis	4	2	3	2	2	3	2		2		2	1					M
Juncus trifidus						1	1	1	1		2	1			1	1	AH
Leontodon autumnalis	1		1	1	1	1	1										C
Loiseleuria procumbens													1		1		AH
Listera cordata			1			1											M

continue

Table 1 continue

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	Ecol. group
Lotus corniculatus	2	2	1	2	3	2	3	2	3	1	3	1	3		4	2	
Luzula arcuata	1						1	1									AH
Luzula frigida	3	3	2	2	3	3	1	3	2			1	3				
Luzula pilosa		1						1									
Luzula spicata	2	2	2	2	2	3	3	3	3	3	3	3	3	3	1	3	AH
Luzula sudetica	3	2	3	2	2	1	2	1	2		2				2	3	
Melampyrum pratense	2	2	2	2	1	2			2		2				2		
Melampyrum sylvaticum		1		2		2		1									
Milium effusum	2	2		2		1											B
Molinia caerulea						1											
Myosotis decumbens	1																B
Myricaria germanica										1							
Nardus stricta	4		4		4	2	4	2									AS
Orthilia secunda	1	1			1										1		H
Oxalis acetosella	2																B
Oxycoccus microcarpus					1				1								M
Oxyria digyna	2		2	2	2	2	3	3	4	3	3	3	3	3	3	3	AS
Paris quadrifolia	2	2		1													B
Pedicularis lapponica								1									AH
Phleum alpinum	3	3	3	3	3	4	3	3	4	2	3	3	3	3	3	3	
Phyllodoce caerulea						1									1		AH
Pinquicula vulgaris	3	1	3	2	3	3	2	2	1		1				2	1	M
Pinus sylvestris					1												
Poa alpigena		1														1	
Poa alpina	2			1		1	1		3	2	3		2	3	2		Ca
Poa annua	2	2	2		1		1		1				1				C
Poa flexuosa						2	1	2	1	2	2	3	2	3		1	AS
Poa glauca						1		2	3		2	1			1	1	
Poa nemoralis		1															B
Poa alpina var. vivipara					1	1	1	2		2		1	2	3			
Poa pratensis	2																C
Polygonum viviparum	2	2	2					1	2		2	1			2		
Potentilla erecta	3	2	2	2	2	2	1										
Potentilla palustris	2	2	1	1													M
Prunus padus	2	2															B
Pyrola minor	3	3	3	4	2	3		2	2		2				1	2	
Ranunculus acris	3	1	2	2	1			1	1				1				C
Ranunculus glacialis						1	1										AS
Ranunculus platanifolius	1	1		1				1									B
Ranunculus repens	3	2		1													C
Rhinanthus minor	2	1	2	2	2		2		2		2				1		
Rubus idaeus		1															B
Rubus saxatilis	1	1		1	1												B

continue

***Table 1** continue*

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	Ecol. group
Rumex acetosella					1			2	2		1	1	1	1			
Rumex acetosa	3	4		3	1	3	2	2	2	2	3	3	1	2		3	
Sagina procumbens	2		2														C
Sagina saginoides						1	2	1	2	1	1						AS
Salix glandulifera	3	2	3	2	3	3	3	3	3		3	2	3		3	3	
Salix glauca	3		4	1	2	2	3	3	4		1						
Salix herbacea	2		2		2	1	2	1	1	1					1		AS
Salix lapponum	4	4	4	4	3	4	3	4	3	2	2	2	2	1	2	3	
Salix nigricans	4	4	4	4	4	4	4	4	4	4	4	3	2	3	4	3	
Saxifraga oppositifolia						1											Ca
Saxifraga rivularis													1				Ca
Saxifraga stellaris	2	2	2	2	2	1	3	3	3	2	3	3	2	3		3	
Scirpus caespitosus	1		2			1											H
Scirpus palustris	1				1												V
Sedum annuum					1												
Sedum rosea						1										1	B
Sibbaldia procumbens					1												AH
Silene acaulis						1	1		1		1						AH
Silene dioica		1		1	1	1				1	1						B
Silene rupestris	2				1	2	2	2	2	2	1	2	1				
Solidago virgaurea	2	1	1	2	1	1	1		1			1		1	1		
Sorbus aucuparia	2	3	3	3	2	3	2	2	1		1		1	1	1		
Sparganium hyperboreum	1																V
Stellaria calycantha	2	3		2													B
Stellaria media	2	2		1		1											C
Stellaria nemorum	4	4		3		2											B
Taraxacum sp.	2	1			1												
Thelypteris phegopteris	2	2													1	1	
Trientalis europaea	3	4	2	2		2			1								
Trifolium repens	2																C
Trisetum spicatum														1			AH
Vaccinium myrtillus	2	2	3	2	2	3	2	2	2		2				3	1	H
Vaccinium uliginosum	2		2	1	2	1	2	1							1		H
Vaccinium vitis-idaea	1				1	2									1		H
Vahlodea atropurpurea	2		3		2		2		1								AS
Valeriana sambucifolia	1	2															B
Veronica alpina					1												AS
Veronica officinalis	1		1														C
Veronica serpyllifolia	2				1				1								C
Viola palustris	3	3	4	2	1	2	4	1	2		2						M

Table 2 *The 32 most common plants on the sandur according to their frequency in the analysed 269 quadrats. - De 32 mest vanlige artene på sanduren i henhold til deres forekomst i 269 undersøkte analyseruter. n = number of occurrences - antall forekomster, d = mean abundance (arithmetic mean). Midlere dekning. Freq. = frequency in %. - Frekvens i %.*

	n	d	Freq.
Salix nigricans	240	2.1	89.2
Racomitrium canescens coll.	192	2.8	71.3
Agrostis mertensii	184	1.1	68.4
Pohlia filum	173	3.3	64.3
Salix lapponum	171	1.7	63.6
Phleum alpinum	150	1.0	55.8
Blasia pusilla	141	2.0	52.4
Deschampsia cespitosa	141	1.5	52.4
Betula pubescens	115	1.2	42.8
Equisetum arvense	115	1.5	42.8
Carex nigra	112	1.4	41.6
Salix glandulifera	99	1.2	36.8
Alnus incana	83	2.9	30.9
Polytrichum commune	81	1.5	30.1
Eriophorum angustifolium	75	1.2	27.9
Juncus filiformis	74	1.0	27.5
Deschampsia alpina	70	1.0	26.0
Philonotis tomentella	58	1.7	21.6
Pyrola minor	58	1.1	21.6
Luzula spicata	57	1.0	21.2
Drepanocladus uncinatus	57	1.6	21.2
Oxyria digyna	56	1.1	20.8
Vaccinium myrtillus	55	1.1	20.4
Luzula sudetica	54	1.0	20.0
Carex canescens	53	1.1	19.7
Sorbus aucuparia	48	1.0	17.8
Empetrum hermaphroditum	47	1.2	17.4
Deschampsia cespitosa	45	1.0	16.7
Carex rostrata	42	2.0	15.6
Saxifraga stellaris	41	1.0	15.2
Poa annua	41	1.0	15.2
Pinguicula vulgaris	41	1.0	15.2
Vaccinium uliginosum	34	1.3	12.6

4.4 Ordination of vascular plant distribution

Data on plant distribution (see **Table 1**) have been combined with ecological data from each of the 16 areas (**Figure 9**) as shown in **Table 3**. For each of these areas the following environmental factors have been evaluated:

The amount of fine-graded sediments (silt and clay) within the sediments (SILT) has been estimated on to a 1-4 scale: 1 = very little silt, i.e. mainly coarse material, 4 = mainly silt in the upper layer. The distance of the areas from the outlet (DIST, in km) and their positionon on the sandur is given by a presece/absence value (W or E). Cover of forest communities (FOREST), shrub communities (SHRUB) and cryptogamic communities (CRYPT) within each area has been estimated according to the following scale: 0 = not recorded, 1 = small amounts, 2 = sparse, 3 = common, and 4 = dominant. On the basis of these data sets a canonical correspondence analysis (ter Braak 1986) has been undertaken.

The ordination (**Figure 10**) indicates that there are two main axes of the species-environment biplot which account for 61.6 % of the variance. This suggests that the major distribution patterns may be explained in terms of these environmental factors. Axis 1 is highly correlated with coarse sediments in the left part of the diagram. Distance is also well correlated with this axis, with the outlet in the right part. Axis 2 is well correlated with sandur side, the eastern side in the upper part and the western part of the sandur in the lower part of the diagram. According to the floristic grouping in **Table 1**, V, B and C plants are situated in the righthand side of the diagram. These are associated with fine-graded sediments close to the outlet. They are found on both sides of the sandur, but with the majority growing on the eastern side.

The typical humus plants (H) are mainly situated in the lower parts of the diagram, i.e. the eastern side, and as are most of the snow-bed indicators (As). Exceptions are *Oxyria digyna*, *Cerastium cerastoides* and *Poa flexuosa* which are very common on riverbanks all over the sandur.

The alpine heath plants (Ah) occur mostly on the left of the diagram, i.e. in the northern part of the sandur.

When growing in the southern part, they are always found on the western side of the sandur where forests are less frequent. The mire plants (M) are mainly found in the upper part of the diagram, i.e. the eastern part of the sandur.

Table 3 *Ecological variables of the different areas on the sandur according to Figure 9. - Økologiske faktorer i de 16 delområdene på sanduren (se figur 9).*

Area	Dist	West	Silt	Forest	Shrub	Crypt
01	0.6	1	4	4	2	2
02	0.6	0	4	4	1	1
03	1.2	1	3	4	3	2
04	1.2	0	3	4	2	2
05	1.8	1	2	1	4	2
06	1.8	0	2	1	3	3
07	2.4	1	1	1	3	3
08	2.4	0	1	1	3	3
09	3.0	1	1	0	2	4
10	3.0	0	1	0	2	4
11	3.6	1	1	0	2	3
12	3.6	0	1	0	2	3
13	4.2	1	1	0	1	2
14	4.2	0	1	0	1	2
15	4.8	1	1	0	1	4
16	4.8	0	1	0	0	1

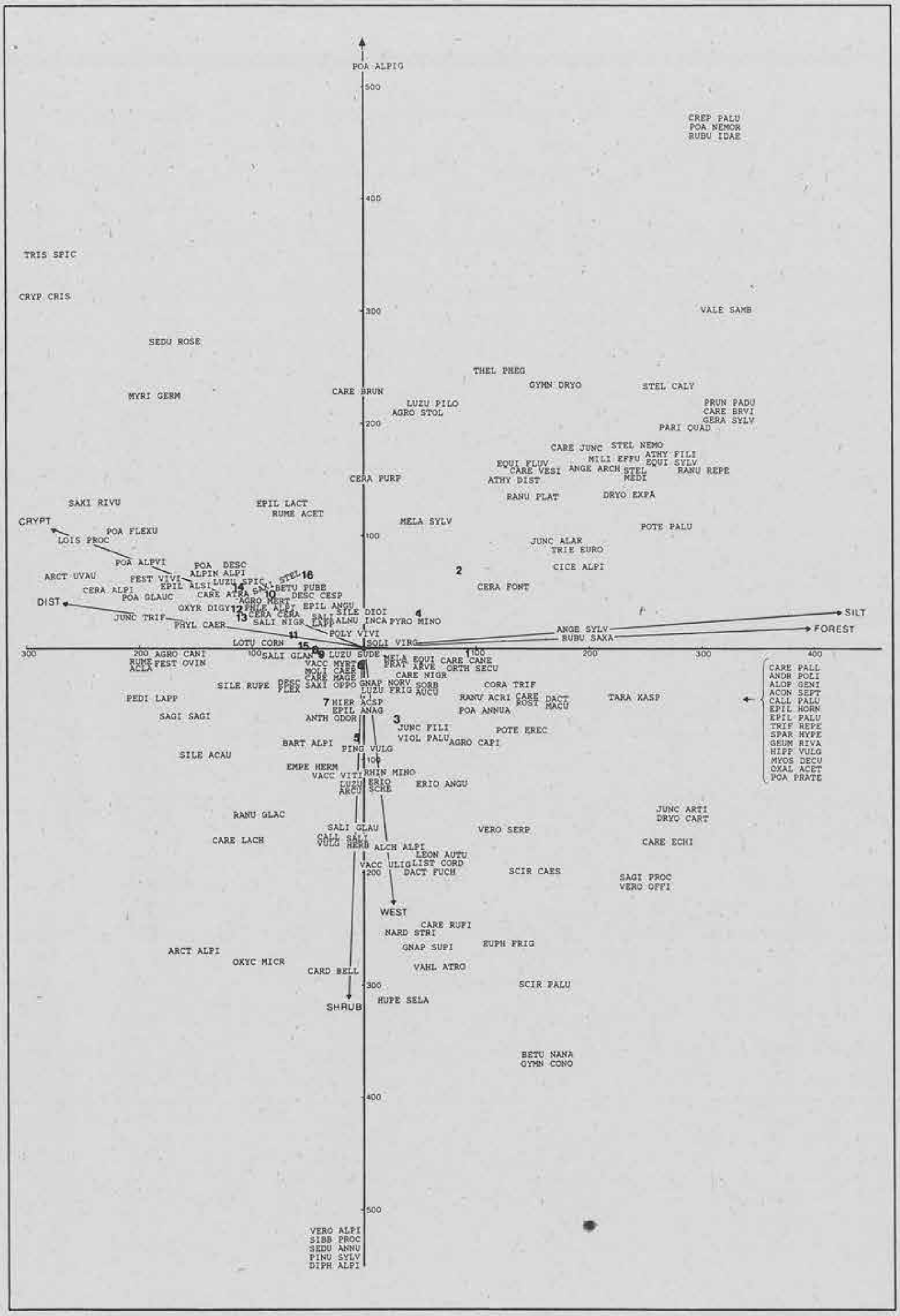


Figure 10
CCA ordination diagram showing the position of species (Table 1), sample areas (Figure 9) and environmental variables (Table 2) in relation to CCA axes 1 and 2. - Ordinasjon (CCA akse 1 og 2) av artene basert på deres forekomst i de 16 delområdene (figur 9) og økologiske faktorer i henhold til tabell 2.

5 Vegetation classification

Phytosociological data from 243 sample plots have been classified by two-way indicator species analysis, TWINSPAN (Hill 1979). Running the program, the pseudospecies cut levels have been set to 1 2 3 4 5. The following taxa have been rendered passive during the program run:

Hepaticae spp. These give information on the total cover of hepatics, *Blasia pusilla* and *Marchantia alpina* excluded.
Lophozia spp., unidentified species.
Scapania spp. all species both identified and unidentified.
Philonotis tomentella (s) i.e. sporophyte producing plants.
Pohlia filum (s) i.e. sporophyte producing plants.
Racomitrium canescens coll. includes both *Racomitrium ericoides* and *R. canescens* subsp. *latifolium*. Otherwise default settings were selected.

The main divisions of the TWINSPAN hierarchical classification and their main indicator species are shown in **Figure 11**. The first division separates the main *Alnus incana* forest quadrats (group 1) from the rest. *A. incana, Deschampsia cespitosa, Rhytidiadelphus squarrosus,* and *Trientalis europaea* are the main indicator species for group 1. In the second division group 0 is separated by several species of which *Racomitrium canescens* coll. (group 00) and *Pohlia filum* (group 01) are quantitatively most important. The 00 groups are characterised by *Racomitrium canescens, Empetrum hermaphroditum, Deschampsia flexuosa, Vaccinium myrtillus,* and *Polytrichum piliferum*. The next division is associated with *Polytrichum piliferum* and *Cladonia mitis* (group 000), and *Phleum alpinum, Salix lapponum,* and *Luzula spicata* (group 001).

The 1 quadrat group is divided into a tall-fern type (group 11), and a grass dominated type (group 10).

The 01 group is separated by the high dominance of *Pohlia filum* in group 010 and a group in which *Alnus incana, Carex nigra, Salix nigricans, S. lapponum* and *Eriophorum angustifolium* are common. Indicator species of the different groups separated at the lower divisions are shown in **Figure 11**.

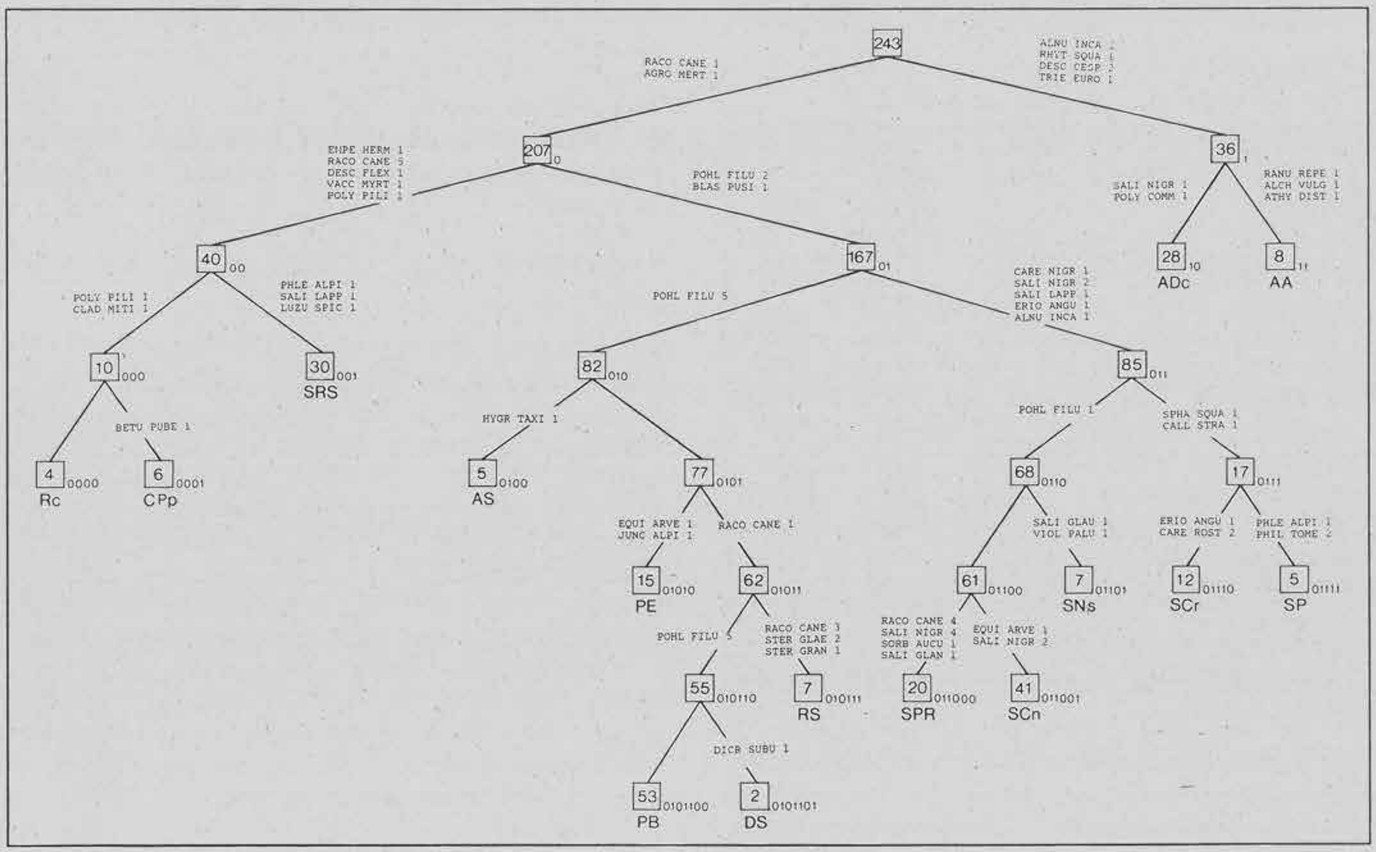


Figure 11
The main TWINSPAN-divisions and their indicator pseudospecies cut-levels. - De første nivåene i TWINSPAN-klassifikasjonen og deres indikatorarter.

5.1 Description of the vegetation types

5.1.1 *Racomitrium canescens* type Rc (group 0000) Table 4

This type includes the pure *Racomitrium canescens* coll. stands in which few other plants occur. Most of the stands are dominated by *R. ericoides*. *Polytrichum piliferum*, *Pogonatum urnigerum* and *Stereocaulon* spp. may also be common. Vascular plants are rare in this type, with only scattered occurrences of *Festuca vivipara*, *Agrostis canina*, *Phleum alpinum*, and *Salix nigricans* juv. Such stands develop on coarse sediments at quite high elevations above the rivers and the ground water level. They have developed on freshly eroded sediments and those cut off by changes in the course of the river. Their main distribution is in the central and northern part of the sandur.

Table 4 Racomitrium canescens *type Rc. Explainations to abbreviations are given in the appendix. -* Racomitrium canescens *type Rc. Forkortelser, se vedlegg.*

Quadrat no. / Anal. nr.	109	110	118	119	F%	C
RACO CANE	5	5	5	5	100.0	5.0
POLY PILI	1	1	1	1	100.0	1.0
STER GRAN	-	1	-	1	50.0	1.0
CLAD MITI	1	-	1	-	50.0	1.0
MASS CARN	1	1	-	-	50.0	1.0
POHL NUTA	-	1	-	1	50.0	1.0
STER RIVU	1	-	-	1	50.0	1.0
LOPH ALPE	-	1	-	1	50.0	1.0
HEPA TSPP	1	1	-	-	50.0	1.0
STER GLAE	1	-	1	-	50.0	1.0
POHL FILU	-	-	1	1	50.0	1.0
ALEC SPP.	1	-	-	-	25.0	1.0
FEST VIVI	-	1	-	-	25.0	1.0
AGRO CANI	1	-	-	-	25.0	1.0
PHLE ALPI	1	-	-	-	25.0	1.0
SALI NIGR	-	1	-	-	25.0	1.0

5.1.2 *Cladonia - Polytrichum piliferum* type CPp (group 0001) Table 5

Six quadrats from the northernmost part of the sandur have been separated from the others. These are situated in a part of the sandur which is not active today. Vegetation here has probably developed without disturbance for more than 80 years (Anda et al. 1982). The sediments consist mainly of stones and gravel with very little sand or fine-graded particles. Small bushes of *Betula pubescens* are common. In a sparse field layer *Salix* spp. juv. and ericaceous species occur in addition to *Agrostis mertensii* and *Deschampsia flexuosa*. The bottom layer is well developed. *Kiaeria starkei*, *Marsupella* spp., *Racomitrium canescens* coll. and *Polytrichum piliferum* are dominants. Lichens, especially *Cetraria islandica*, *Cladonia bellidiflora*, *C. ecmocyna*, *C. mitis*, *C. pleurota* and *Lecidea granulosa*, are also common.

5.1.3 *Salix - Racomitrium - Stereocaulon* type SRS (group 001) Table 6

These stands are characterised by a ca. 1.5 m high shrub layer of *Salix glandulifera*, *S. lapponum*, *S. nigricans* and small bushes of *Betula pubescens*. The field layer is generally sparse, but *Lotus corniculatus* may be dominant. In addition *Deschampsia flexuosa*, *Empetrum hermaphroditum*, *Luzula spicata*, *Agrostis mertensii*, *Vaccinium uliginosum*, *V. myrtillus*, and *Phleum alpinum* are constant species. The bottom layer is dense, generally completely dominated by *Racomitrium canescens* coll. *Stereocaulon* spp. (most often *S. grande*) may be co-dominant.

The stands are found on coarse sediments of dry sites which are normally uninfluenced by the daily water-level fluctuation. Their main distribution is in the central and northern part of the sandur.

5.1.4 *Anthelia julacea - Scapania* spp. type AS (group 0100) Table 7

This moss community has only a sparse field layer in which juvenile plants of *Salix herbacea*, *Luzula spicata*, *Oxyria digyna*, and *Agrostis mertensii* occur. The bottom layer is dominated by *Anthelia julacea*, *Scapania uliginosa*, *S. undulata* and *Nardia compressa*. The stands are extremely rich in cryptogams, up to 41 species in a 2 m quadrat. It is richer in species than the other types, and many of the cryptogams are only found in stands of this group.

The stands are always found in old river channels after changes in the course of the river. Here both sand and silt have been laid down with a thin organic top layer developed by the decay of moss. The soil is quite wet, and influenced by the daily water-level fluctuations, but the stands are not influenced by erosion or sedimentation from running water.

The stands are most common in the central parts of the sandur, 1-2 km from the outlet.

Table 5 Cladonia-Polytrichum piliferum *type CPp.*

	1			1				
Quadrat no.	6	8	0	7	9	1		
Anal. nr.	9	9	0	9	9	0	F %	C
RACO CANE	2	2	1	1	5	1	100.0	2.0
POLY PILI	1	2	2	2	1	2	100.0	1.7
BETU PUBE	1	1	1	2	1	1	100.0	1.2
SALI NIGR	1	1	1	1	1	1	100.0	1.0
HEPA TSPP	3	-	1	3	2	4	83.3	2.6
KIAE STAR	1	4	4	-	2	2	83.3	2.6
MARS EMAR	1	-	1	3	2	4	83.3	2.2
CLAD BELL	1	1	2	1	-	1	83.3	1.2
DESC FLEX	-	1	1	1	1	1	83.3	1.0
CETR ISLA	1	1	1	1	1	-	83.3	1.0
EMPE HERM	1	-	1	1	1	1	83.3	1.0
LECI GRAN	1	1	1	1	-	1	83.3	1.0
SALI HERB	1	-	1	1	1	1	83.3	1.0
AGRO MERT	1	-	1	1	1	-	66.7	1.0
CLAD ECMO	-	1	1	1	-	1	66.7	1.0
CLAD MITI	1	-	1	-	1	1	66.7	1.0
CLAD PLEU	1	2	-	1	1	-	66.7	1.3
CLAD GRAC	1	1	-	1	-	-	50.0	1.0
CLAD PYXI	-	-	1	1	1	-	50.0	1.0
CLAD RANG	1	1	1	-	-	-	50.0	1.0
CLAD UNCI	1	1	1	-	-	-	50.0	1.0
DICR FUSC	1	1	-	1	-	-	50.0	1.0
POHL NUTA	-	-	1	-	1	1	50.0	1.0
RACO AFFI	-	1	1	1	-	-	50.0	1.0
SALI GLAN	1	-	-	1	1	-	50.0	1.0
VACC MYRT	1	-	1	1	-	-	50.0	1.0
CEPH SPP.	1	-	-	1	-	-	33.3	1.0
CLAD CRIS	1	-	1	-	-	-	33.3	1.0
CLAD DEFO	1	1	-	-	-	-	33.3	1.0
GYMN CONC	1	-	-	-	-	1	33.3	1.0
LEPR NEGL	-	-	1	1	-	-	33.3	1.0
POLY ALPI	1	-	-	-	1	-	33.3	1.0
SALI LAPP	-	-	-	-	1	1	33.3	1.0
SOLO CROC	1	-	-	1	-	-	33.3	1.0
STER GRAN	1	1	-	-	-	-	33.3	1.0
STER TOME	1	-	-	1	-	-	33.3	1.0

Species in addition. - Arter i tillegg:
100: STER RIVU, CLADVE RT, 69: CALL VULG, CETR DELI, 89: CLAD CORN, CLADPH YL,79: CLAD MACR, CLAD PITY, CLAD STRI, 99: ERIO ANGU, HIER SPP.

The daily water-level fluctuations make it difficult for vascular plants to establish and survive in these sites, and with no change in the environment, this type will probably remain fairly constant. It can be recognized as being equivalent to the *Anthelia* snow-beds in the mountains. They have several species in common, e.g. *Eriophorum scheuchzeri*, *Cardamine bellidiflora*, *Carex rufina*, *Moerchia blyttii* and *Ranunculus glacialis*.

5.1.5 *Pohlia filum - Equisetum arvense* type PE (group 01010) Table 8

The field layer is usually sparse, but creeping *Equisetum arvense* is abundant in many quadrats. In addition *Juncus alpinoarticulatus*, *Deschampsia alpina*, *Agrostis mertensii*, *Eriophorum scheuchzeri* and juvenile plants of *Salix nigricans* are common. The bottom layer is dominated by *Pohlia filum*, generally the gemmiferous form.

This type is always found in sites rich in fine-graded sediments. The stands are situated close to the rivers, and heavily influenced by the daily water-level fluctuations. They are, therefore, often inundated. A controlling factor for this type is probably the effect of fine particle sedimentation upon the vegetation.

After heavy fine particle sedimentation upon well developed vegetation cover, this type is the first to be re-established.
Its main distribution is in the southernmost part of the sandur, by the outlet. Here the river speed is slow, and great areas are inundated by the daily water-level fluctuations.

Type PE represents the most dynamic vegetation community on the sandur. Plants growing here must reestablish themselves each year. They start to grow in early summer, and most of them die as a result of flooding and sedimentation. This vegetation type is fairly stable, but it has a complete vegetation turnover each year.

5.1.6 *Pohlia filum - Blasia pusilla* type PB (group 0101100) Table 9

Table 9 shows the floristic composition of 53 quadrats of *Pohlia filum*-dominated stands. These have a sparse field layer and a well developed moss layer. The most common vascular plants are *Oxyria digyna*, *Agrostis mertensii*, *Luzula spicata*, *Deschampsia alpina*, *D. cespitosa*, *Saxifraga stellaris*, *Cerastium cerastioides*, *Salix lapponum* juv., *S. nigricans* juv. and *Phleum alpinum*. *Pohlia filum* is dominant, but also *Racomitrium canescens* coll. (mainly ssp. *latifolium*), *Philonotis tomentella* and *Blasia pusilla* are also common and co-dominant.

Table 6 Salix-Racomitrium-Stereocaulon *type SRS.*

	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2										1		
Quadrat no.	1	4	4	1	1	5	6	9	9	9	9	6	6	9	0	4	4	5	5	6	5	5	5	5	6	6	5	5	5	6		
Anal nr.	7	3	8	2	5	9	0	8	5	6	7	2	6	9	0	8	9	0	9	0	2	3	7	8	0	5	1	5	6	1	F %	C
RACO CANE	5	5	4	4	5	3	4	4	5	5	5	5	5	5	5	5	5	4	5	5	5	1	5	5	5	5	5	5	5	3	100.0	4.6
SALI NIGR	1	1	1	1	1	1	1	1	2	1	3	3	3	3	1	2	2	1	2	1	4	4	5	3	4	5	4	1	1	1	100.0	2.1
AGRO MERT	1	1	1	1	-	1	1	1	1	1	1	1	-	1	1	1	1	1	-	-	1	1	1	1	1	1	2	1	1	1	86.7	1.0
SALI GLAN	1	-	-	-	-	1	1	-	1	2	1	1	1	2	1	2	3	3	3	4	1	1	1	1	1	1	1	2	2	1	83.0	1.6
BETU PUBE	-	-	-	-	-	2	1	1	1	1	1	1	3	1	4	3	2	3	-	1	1	1	1	1	1	1	1	1	1	2	80.0	1.5
SALI LAPP	1	1	1	-	-	1	1	-	1	-	1	-	3	-	3	2	2	2	1	1	2	3	4	3	1	1	2	3	1	1	80.0	1.8
EMPE HERM	-	-	-	-	-	1	1	1	-	1	1	2	1	-	2	1	1	2	1	1	1	1	1	1	1	1	1	2	2	1	76.7	1.2
VACC MYRT	1	-	1	-	-	1	1	-	1	4	1	-	-	-	1	1	1	2	1	1	1	1	-	1	1	1	1	1	1	1	73.3	1.2
PHLE ALPI	-	-	-	1	-	1	-	-	1	1	1	1	-	1	1	1	1	1	1	1	1	-	1	1	1	1	1	1	1	-	70.0	1.0
DESC FLEX	1	-	1	1	-	-	-	-	1	-	-	1	-	1	1	1	1	1	1	1	1	-	1	1	-	-	1	1	1	1	63.3	1.0
LUZU SPIC	1	1	1	1	1	1	1	1	1	-	1	1	1	1	-	1	1	-	1	-	-	-	-	-	-	-	1	-	1	1	63.3	1.0
HEPA TSPP	3	1	4	3	1	-	-	1	1	1	1	-	-	1	1	1	-	1	-	-	1	-	1	-	1	-	1	1	-	-	60.0	1.4
LOTU CORN	-	-	-	-	1	1	-	-	-	-	-	3	-	4	1	3	5	5	4	5	-	-	2	-	1	1	-	1	-	1	50.0	2.5
OXYR DIGY	-	1	-	-	1	1	1	-	1	-	1	1	1	1	1	-	-	-	-	-	-	-	-	1	-	-	1	-	1	-	43.3	1.0
STER SPP.	-	2	1	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1	-	1	-	1	1	1	-	1	-	2	-	40.0	1.2
STER GRAN	-	-	-	1	1	5	3	4	1	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	40.0	1.9
VACC ULIG	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	1	-	1	-	-	1	-	1	1	-	1	2	1	1	1	40.0	1.1
PYRO MINO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	2	1	-	1	1	1	1	1	-	1	-	36.7	1.1
SALI HERB	-	-	-	-	-	1	1	-	1	-	-	-	-	-	1	1	-	1	-	-	-	-	1	1	-	-	1	1	1	-	36.7	1.0
LUZU SUDE	-	-	-	-	-	-	-	-	1	-	-	1	-	1	-	-	-	-	-	-	1	-	-	1	-	1	1	1	-	1	30.0	1.0
PING VULG	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-	1	-	1	1	-	1	1	-	-	1	30.0	1.0
POLY COMM	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	2	1	1	-	26.7	1.1
POHL FILU	-	-	1	-	-	-	-	-	1	1	3	2	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	26.7	1.4
BART ALPI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	1	3	1	-	-	-	-	1	1	-	-	-	26.7	1.3
BLAS PUSI	-	-	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-	1	-	1	-	-	1	-	-	23.3	1.0
CARE NIGR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	1	1	-	1	1	1	23.3	1.0
DESC ALPI	-	-	-	1	1	-	1	-	1	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	23.3	1.0
DESC CESP	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	1	1	1	-	1	-	-	-	1	-	-	-	23.3	1.0
POLY PILI	1	1	1	1	1	-	-	3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.3	1.3
FEST VIVI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	-	-	-	1	1	1	-	-	-	20.0	1.0
POLY SEXA	-	-	1	-	-	-	-	1	1	-	2	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.0	1.2
ANTH ODOR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	1	-	-	1	1	-	-	16.7	1.0
SORB AUCU	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	1	-	-	-	-	16.7	1.0
CARE BRUN	-	-	-	-	-	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	13.3	1.0
POAA LPIN	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	-	13.3	1.0
POTE EREC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	13.3	1.0
RACO LANU	-	-	-	-	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.3	1.0
CLAD COCC	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.0	1.0
CLAD MITI	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	10.0	1.0
POAF LEXU	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	10.0	1.0
STER GLAE	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	10.0	2.0

continue

***Table 6** continue*

	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2										1		
Quadrat no.	1	4	4	1	1	5	6	9	9	9	9	6	6	9	0	4	4	5	5	6	5	5	5	5	6	6	5	5	5	6		
Anal nr.	7	3	8	2	5	9	0	8	5	6	7	2	6	9	0	8	9	0	9	0	2	3	7	8	0	5	1	5	6	1	F %	C
VACC VITI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	-	-	-	-	-	-	-	-	10.0	1.0
VAHL ATRO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-	-	10.0	1.0
CETR SLA	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.7	1.0
PELT CANI	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	6.7	1.0
PHYL CAER	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	6.7	1.0
POAV IVIP	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.7	1.0
CERA CERA	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.7	1.0
EPIL HORN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	6.7	1.0
HUPE SELA	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	6.7	1.0
JUNC FILI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	6.7	1.0
MARS SPP.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	6.7	1.5
NARD STRI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	6.7	1.0
POLY VIVI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	6.7	1.0

Species in addition. - Arter i tillegg:
65: AGRO CANI,DREP UNCI,ERIO ANGU, 51: VIOL PALU, SCIR CAES, PELT APTH, EPIL ANAG, AGRO CAPI, ALCH ALPI, 159: ARCT UVAU, 117: SILE RUPE, POGO URNI, CARE RUFI, KIAE STAR, CEPH SPP., OLIG HERC, ORTH FLOE, 143: CARE SP., 56: EQUI ARVE, 52: EUPH FRIG, PELT SPP., 161: JUNC TRIF, 199: LUZU FRIG, 166: ORTH SECU, 162: POHL FILS, 148: POLY JUNI, 250: DACT MACU.

Pohlia filum is most frequent on fine-graded sediments. It does not tolerate long dry periods, and the stands are mainly found on river banks. It is distributed all over the sandur, but its main area is in the central and southern parts where fine-graded particles have been laid down.

Within this type plants producing both gemmae and sporophytes are common, and they show an interesting spatial distribution in relation to the water-level. In the quadrats situated close to the water-level only sterile or gemmae-producing plants are found. At a certain level, there are increasing numbers of sporophyte-producing plants (named *Pohlia filum* (s) in some Tables) in the vegetation. The capsules and setas give these plants a reddish colour, distinctly separating them from the green sterile or gemmae producing individuals.

Type PB represents the initial plant community on newly exposed sediments on the sandur. All sediments which are not too dry, and which have some fine particles, are invaded by *Pohlia filum*.

How the vegetation further develops depends mainly on the position of the sites in relation to water-level fluctuation.

5.1.7 *Dicranella subulata - Scapania obcordata* type DS (group 0101101) Table 10

This type is characterised by tufts of *Dicranella subulata* in a dense moss mat of *Scapania obcordata*, *Cephalozia biambigua* ssp. *biambigua* and *Racomitrium ericoides*. Vascular plants are sparse, mainly typical pioneers with juvenile plants. The floristic composition indicates that this type lies in an intermediate position between PB on fine sediments and SPR on more coarse material. The presence of *Blasia pusilla* and *Ditrichum pusillum* show the similarity to PB, while *Racomitrium ericoides* and Polytrichacees are indicative of an affinity with the drier *Racomitrium* types.

Such stands are found in depressions within *Racomitrium canescens*-dominated areas, which have formerly been river-beds. The sediments are moist with both fine and coarse particles. Their main distribution is in the central part of the sandur.

Table 7 Anthelia julacea-Scapania *spp. type AS.*

Quadrat no. Anal. nr.	1 0 2	1 0 3	1 0 4	1 0 6	1 0 5	F %	C
HEPA TSPP	5	5	5	5	5	100.0	5.0
ANTH JULA	3	4	4	2	3	100.0	3.2
SCAP ULIG	4	3	2	3	2	100.0	2.8
SCAP UNDU	2	2	1	2	3	100.0	2.0
NARD COMP	3	2	1	1	1	100.0	1.6
NARD SCAL	1	2	2	1	1	100.0	1.4
SCAP SUBA	1	1	2	1	2	100.0	1.4
MARS SPHA	1	1	2	1	1	100.0	1.2
HYGR TAXI	1	1	1	1	1	100.0	1.0
RACO CANE	1	1	1	1	1	100.0	1.0
SALI LAPP	1	1	1	1	1	100.0	1.0
SCAP ANSP	1	1	1	1	1	100.0	1.0
PHIL TOME	1	1	1	1	1	100.0	1.0
SCAP IRRI	1	1	-	1	1	80.0	1.0
LUZU SPIC	1	1	-	1	1	80.0	1.0
OXYR DIGY	1	1	-	1	3	80.0	1.5
CALL SARM	1	1	-	1	1	80.0	1.0
SCAP OBSC	1	-	1	1	1	80.0	1.0
PLEU ALBE	1	1	1	1	-	80.0	1.0
SPHA AUAU	-	1	1	1	1	80.0	1.0
DREP EXAP	1	1	-	1	1	80.0	1.0
AGRO MERT	1	-	1	1	1	80.0	1.0
SAXI STEL	1	1	-	1	1	80.0	1.0
SOLE SPNA	1	1	-	1	1	80.0	1.0
POHL DRUM	1	-	-	1	1	60.0	1.0
SOLE OBOV	1	-	1	-	1	60.0	1.0
SOLE SUBE	-	1	-	1	1	60.0	1.0
CALL STRA	-	1	-	1	1	60.0	1.0
MARS EMAR	1	-	1	-	1	60.0	1.0
LOPH WENZ	-	1	-	1	1	60.0	1.0
CEPH LUNU	1	-	-	1	1	60.0	1.0
SCAP HYPE	-	1	-	1	1	60.0	1.0
CEPH BIAM	1	-	-	1	1	60.0	1.0
KIAE STAR	-	-	-	1	1	40.0	1.0
SOLE SP.	1	-	-	-	1	40.0	1.0
DESC ALPI	-	1	1	-	-	40.0	1.0
DITR PUSI	1	-	-	-	1	40.0	1.0
POLY COMM	-	1	-	1	-	40.0	1.0
NARD GEOS	1	-	1	-	-	40.0	1.0
OLIG HERC	1	-	-	-	1	40.0	1.0

continue

Table 7 continue

Quadrat no. Anal. nr.	1 0 2	1 0 3	1 0 4	1 0 6	1 0 5	F %	C
BLIN ACUT	-	-	1	-	1	40.0	1.0
DICR PALU	-	-	-	1	1	40.0	1.0
MARS SPAR	-	1	-	1	-	40.0	1.0

Species in addition. - Arter i tillegg:
102: SCAP IRRR, LOPH ALPE, CEPH SPP., 103: PING VULG, SALI HERB, ERIO SCHE, 104: POHL FILU, 106: RACO ACIC, RICC PING, LOPH SPP., RANU GLAC, SPHA GIRG, 105: SCAP OBCO, CARD BELL, CARE RUFI,
CLAD UNCI, POGO URNI, HARP FLOT, BETU PUBE, CARE CANE, MONT LAMP, MOER BLYT,CEPH BIBI

5.1.8 *Pohlia filum-Racomitrium canescens - Stereocaulon* type PRS (group 010111) Table 11

This type has a very sparse field layer in which only *Agrostis mertensii*, *Luzula spicata*, and *Salix nigricans* (juv.) are common.

The bottom layer is dense and dominated by *Pohlia filum*, *Racomitrium canescens* and *Stereocaulon glareosum*. *Pohlia filum* is much less abundant in this type than in PB. Often is a black mat of dead *Pohlia filum* present in which *Racomitrium canescens* becomes established. The sediments are also drier than in the PB type, and species such as *Oxyria digyna*, *Saxifraga stellaris*, *Cerastium cerastoides*, *Philonotis tomentella* and *Carex canescens* are scarse or absent.

The stands are found on sites with coarse material, mainly in the northern part of the sandur. The sites are quite dry, probably due to changes in water-level.

5.1.9 *Salix - Pohlia - Racomitrium* type SPR (group 011000) Table 12

Vegetation of this type is characterised by a ca. 1.5 m high shrub layer, dominated by *Salix glandulifera*, *S. lapponum*, and *S. nigricans*. In addition small bushes of both *Betula pubescens* and *Sorbus acuparia* are common. The field layer is sparse. Common species are *Lotus corniculatus*, *Agrostis mertensii*, *Deschampsia alpina*, *D. cespitosa*, and *Phleum alpinum*. The

Table 8 Pohlia filum-Equisetum arvense *type PE.*

Quadrat no. / Anal. nr.	88 / 8	190 / 0	191 / 1	192 / 2	194 / 4	222 / 2	211 / 1	212 / 2	223 / 3	224 / 4	213 / 3	214 / 4	215 / 5	216 / 6	217 / 7	F %	C
POHL FILU	2	2	5	3	2	3	1	2	3	3	4	5	4	5	5	100.0	3.3
EQUI ARVE	5	5	4	3	3	3	1	-	-	1	1	3	2	1	1	86.7	2.5
SALI NIGR	1	1	1	1	1	-	1	1	1	-	1	1	1	1	1	86.7	1.0
CARE NIGR	-	-	-	1	-	1	1	1	1	3	-	1	1	1	1	66.7	1.2
JUNC ALPI	1	-	-	-	-	-	1	1	-	1	1	1	1	1	1	60.0	1.0
AGRO MERT	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	60.0	1.0
DESC CESP	-	-	-	-	-	-	1	1	1	-	1	2	1	1	1	53.3	1.1
ERIO SCHE	-	-	-	-	-	-	1	1	-	1	1	1	1	1	1	53.3	1.0
DESC ALPI	-	-	-	-	-	-	1	1	-	1	1	1	-	-	1	40.0	1.0
CARE CANE	-	-	-	-	-	-	-	-	-	1	1	-	1	1	1	33.3	1.0
POAA NNUA	1	1	-	1	-	-	-	-	1	1	-	-	-	-	-	33.3	1.0
BLAS PUSI	-	-	1	-	-	-	-	-	-	-	-	1	2	2	1	33.3	1.4
PHLE ALPI	-	-	-	-	-	-	1	-	-	-	1	-	1	1	-	26.7	1.0
ERIO ANGU	-	-	-	-	-	-	-	-	-	-	1	3	-	1	-	20.0	1.7
POHL FILS	-	-	-	-	-	-	-	-	-	-	-	-	2	2	4	20.0	2.7
JUNC FILI	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	13.3	1.0
PHIL TOME	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	13.3	1.0
BRYU SPP.	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	13.3	1.0
CALL STRA	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	13.3	1.0

Species in addition. - Arter i tillegg:
214: SALI GLAN, OLIG HERC, POHL BULB 88: RACO CANE, 217: HEPA TSPP, NARD SCAL, 213: POAF LEXU.

bottom layer is dense and dominated by *Racomotrium canescens* coll. and *Pohlia filum*. In addition *Blasia pusilla* and *Polytrichum commune* are common.

The stands are found on sand and gravel. They are, however, situated close to the water-level, and the vegetation is therefore periodically wet. The stands have their main distribution in central parts of the sandur, some 2-3 km from the outlet.

5.1.10 *Salix - Carex nigra* type SCn (group 011001) Table 13

This type has a 1.5-2.5 m high shrub layer dominated by *Salix nigricans*, *S. lapponum* and/or *Alnus incana*. The field layer has, in general, a cover of 20-30 %. Constant species are *Carex nigra*, *Eriophorum angustifolium*, *Equisetum arvense*, *Carex rostrata*, *Agrostis mertensii*, *Phleum alpinum*, *Juncus filiformis* and *Deschampsia cespitosa*. The bottom layer is quite dense, with *Racomitrium canescens* coll., *Pohlia filum*, *Polytrichum commune*, and *Blasia pusilla* as the most important species.

The stands are always found on fine sediments. During the vegetative period they are periodically flooded by the high ground water-level. This is indicated by the high frequency of hygrophilous species such as *Eriophorum angustifolium*, *Carex nigra* and *Juncus filiformis*. In some stands *Sphagnum* spp. and *Philonotis tomentella* are also common. This is the most frequent *Salix* shrub type, covering large areas in the central parts of the sandur.

The vegetation has a limited distribution both north and west of the dense *Alnus incana* forest area.

Table 9 Pohlia filum-Blasia pusilla *type PB.*

											1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2		
Quadrat no.	8	8	8	8	9	9	9	9	9	9	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	5	5	5	5	5	5	6	6	0	0	0	0	5	5	5	5	5	5	5		
Anal. nr.	5	6	7	9	0	1	2	3	4	5	0	2	3	4	5	7	8	1	2	3	4	5	6	7	8	9	0	1	2	4	5	6	7	9	0	2	3	4	6	7	4	5	4	5	6	9	1	2	3	4	5	6	8	F %	C
POHL FILU	5	5	3	5	5	5	5	5	5	5	5	5	3	5	5	5	5	5	5	5	5	5	5	2	4	5	5	5	5	5	5	5	4	4	4	5	5	5	4	4	4	5	5	5	2	5	2	3	5	5	5	3	5	100.0	4.0
AGRO MERT	2	1	1	1	-	-	1	1	1	-	1	1	1	1	-	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	-	-	1	1	1	1	1	88.6	1.0
SALI NIGR	1	1	1	1	1	1	1	2	-	1	1	1	-	-	-	1	1	1	2	1	1	1	1	-	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	2	1	1	2	1	3	1	1	1	-	1	1	1	88.6	1.3
RACO CANE	1	1	2	1	1	1	1	1	-	-	1	1	-	1	2	1	2	1	1	1	1	1	1	-	3	1	1	1	3	2	2	2	3	4	1	1	1	2	3	1	4	2	-	-	1	1	-	-	1	-	1	-	2	81.1	1.5
BLAS PUSI	-	-	1	1	1	3	4	3	-	3	-	2	-	1	1	3	3	4	2	4	4	-	-	-	1	2	3	3	2	2	2	1	1	2	1	2	3	2	1	1	1	4	-	-	-	1	5	-	2	1	-	1	1	75.4	2.1
PHLE ALPI	1	1	1	-	-	1	1	1	-	-	-	1	-	-	-	-	1	2	1	-	1	-	-	-	1	1	1	1	1	1	1	1	-	-	1	1	1	-	1	1	-	-	-	-	1	1	-	-	1	-	-	1	1	54.7	1.0
HEPA TSPP	-	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	4	1	3	2	1	4	1	-	-	-	1	-	2	-	-	-	-	-	-	1	52.8	1.3
DESC ALPI	1	1	-	-	-	-	1	-	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	1	1	1	1	1	2	1	1	1	1	1	1	-	-	-	1	-	-	-	1	1	1	-	-	1	-	-	1	1	50.9	1.0
OXYR DIGY	-	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	1	2	2	2	1	-	1	-	1	1	1	1	1	1	1	1	2	1	-	-	1	1	1	-	2	49.0	1.1
PHIL TOME	2	2	4	1	1	1	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2	2	-	-	-	-	-	-	1	1	2	4	-	-	3	3	1	1	1	1	-	1	1	5	-	45.2	1.8
SALI LAPP	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	1	-	1	1	1	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	1	-	3	-	-	-	-	1	-	1	45.2	1.0
SAXI STEL	1	1	1	-	-	-	1	-	-	-	1	-	-	-	-	-	1	-	-	-	1	-	1	1	1	-	-	-	1	1	1	1	-	-	1	-	-	-	-	1	-	-	1	-	1	1	-	-	1	1	1	1	1	45.2	1.0
CERA CERA	-	2	2	1	1	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1	1	-	1	1	-	1	1	1	1	1	1	1	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	1	1	43.4	1.0
DESC CESP	1	-	1	-	-	1	-	1	-	-	-	-	-	1	-	1	1	1	1	-	-	-	-	-	-	-	1	-	1	-	-	-	-	1	-	-	-	-	1	-	-	-	1	1	1	1	-	-	-	1	-	1	-	35.8	1.0
LUZU SPIC	1	-	1	-	-	-	1	-	1	-	1	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	35.8	1.0
POHL FILS	-	3	1	3	5	5	5	5	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	-	1	1	1	-	1	5	-	1	-	-	30.1	2.8
SALI GLAN	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	1	1	-	1	1	-	-	-	-	-	1	-	-	1	-	1	-	1	1	1	-	1	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	30.1	1.0
CARE RUFI	1	-	1	1	1	-	-	-	-	-	-	-	-	1	-	1	1	1	1	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.7	1.0
STER GLAE	-	-	-	1	-	1	1	-	-	-	-	1	1	1	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.7	1.1
EPIL ANAG	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	1	1	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.8	1.0
EQUI ARVE	-	-	-	-	-	-	-	1	-	4	-	-	-	-	1	1	1	1	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	18.8	1.3
POLY COMM	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	1	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	18.8	1.0
CARE CANE	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	15.0	1.0
POLY PILI	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.0	1.0
RUME ACET	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	1	-	-	15.0	1.0
BETU PUBE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	1	1	-	-	1	-	1	-	-	13.2	1.0
DITR PUSI	-	1	-	-	1	1	1	2	L	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.2	1.1
JUNC FILI	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	13.2	1.0
NARD GEOS	-	1	1	-	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.2	1.0
POAF LEXU	1	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	13.2	1.0
SCAP SPP.	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	2	1	1	-	-	13.2	1.2
CALL STRA	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	-	-	-	11.3	1.0
LUZU SUDE	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	11.3	1.0
CEPH BIAM	-	-	-	-	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.4	1.0
DREP UNCI	-	1	1	-	-	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.4	1.0
MARC ALPE	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.4	1.0
OLIG HERC	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1	-	-	-	9.4	1.2
POAA LPIN	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	9.4	1.0
POAA NNUA	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.4	1.0
SCAP OBCO	-	-	-	-	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.4	1.0
LOTU CORN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7.5	1.0
CARE NIGR	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	1.0

continue

Table 9 *continue*

											1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2		
Quadrat no.	8	8	8	8	9	9	9	9	9	9	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	5	5	5	5	5	5	6	6	0	0	0	0	5	5	5	5	5	5	5		
Anal. nr.	5	6	7	9	0	1	2	3	4	5	0	2	3	4	5	7	8	1	2	3	4	5	6	7	8	9	0	1	2	4	5	6	7	9	0	2	3	4	6	7	4	5	4	5	6	9	1	2	3	4	5	6	8	F %	C
FEST VIVI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1	1	-	-	-	-	-	-	-	-	-	7.5	1.0
POLY SEXA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	1.0
SCAP CURT	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	1.0
DESC FLEX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	5.6	1.0
ERIO ANGU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.6	1.0
POAG LAUC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	5.6	1.0
STER SPP.	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.6	1.0
AGRO CANI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	3.7	1.0
AULA PALU	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.7	1.0
BRYU SPP.	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.7	1.0
POHL WAHL	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.7	1.0
POLY JUNI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.7	1.0
SCAP SUBA	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.7	1.0
STER GRAN	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.7	1.0
VACC MYRT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.7	1.0

Species in addition. - Arter i tillegg 253: ANTH JULA, 129: CALA PURP, 144: CALL SARM, 255: CARE BRUN, 93: CEPH SPP., KIAE GLAC, 131: EPIL HORN, 205: NARD SCAL, ERIO SCHE, 92: GNAP NORV, SOLE SP., 90: LOPH ALPE, SILE ACAU, ANTH JURA, 91: PELT SPP., 87: JUNC TRIF, ANTH ODOR, POHL SPP., POGO URNI, PHIL SERI, 164: SPHA GSPP, PING VULG, 85: POHL DRUM, 131: RANU ACRI, 204: RANU GLAC, 147: SAGI SAGI, 209: SPHA MAGE, SPHA SQUA, 149: EMPE HERM, 253: LUZU FRIG

5.1.11 *Salix - Nardus stricta* type SNs (group 01101) Table 14

Stands belonging to this type sometimes have scattered trees (*Alnus* or *Betula*) and a shrub layer of small willows, mainly *Salix glauca* and *S. lapponum*. The field layer cover 20-40 %. Dominants are *Nardus stricta*, *Empetrum hermaphroditum* or *Vaccinium uliginosum*. Other constants are *Calluna vulgaris*, *Vahlodea atropurpurea*, *Agrostis mertensii*, *Carex echinata*, *C. nigra*, *Potentilla erecta*, *Juncus filiformis*, *Viola palustris*, *Pinguicula vulgaris*, *Luzula sudetica*, *Eriophorum angustifolium*, *Deschampsia cespitosa* and *Trientalis europaea*. The bottom layer is dense and dominated by *Racomitrium canescens* coll., *Pleurozium schreberi*, *Poltyrichum commune* and *Drepanocladus uncinatus*.

Type SNs is floristically well separated from the other types, with several species which are rare outside this community, e.g. *Salix glauca*, *Carex echinata*, *Vahlodea atropurpurea*, *Nardus stricta*, *Empetrum hermaphroditum*, and *Pleurozium schreberi*. The stands are always found on fine-graded sediments, quite high above the water-level. Their distribution is strictly restricted to the southwestern part of the sandur.

5.1.12 *Salix - Carex rostrata* type SCr (group 01110) Table 15

A 1.5-2.0 m high dense shrub layer of *Salix lapponum* and *S. nigricans* is characteristic for these stands. The field layer is also quite dense, and generally dominated by *Carex rostrata*. Other common species are *Eriophorum angustifolium* and *Equisetum arvense*. The bottom layer is dominated by *Calliergon stramineum*, *Drepanocladus uncinatus* and *Sphagnum squarrosum*. The stands are very species-poor, and typical alpine pioneer species are almost completely absent.

Such communities are always found on fine sediments, often with a thin organic layer. They are situated at a low level in relation to the water-level. This is indicated by the occurrence of hygrophilous species such as *Calliergon* spp., *Sphagnum* spp., *Scapania* spp., *Drepanocladus exannulatus*, *Pohlia wahlenbergii*, and *Harpanthus flotowianus*.

Their distribution is concentrated on the southeastern part of the sandur.

Table 10 Dicranella subulata-Scapania obcordata *type DS*

	11
Quadrat no.	00
Anal. nr.	78
DICR SUBU	34
SCAP OBCO	34
CEPH BIAM	32
RACO CANE	23
NARD GEOS	12
POHL NUTA	11
LUZU SPIC	11
POGO URNI	11
AGRO MERT	11
SCAP ANSP	11
SAXI STEL	11
CARE RUFI	11
OLIG HERC	11
SCAP CURT	11
POHL FILU	11
PHIL TOME	11
BLAS PUSI	11
SALI LAPP	11
BETU PUBE	11
LUZU SUDE	11
SALI NIGR	11
POHL DRUM	11
DREP UNCI	11
POLY COMM	11
LOPH ALPE	11
STER GLAE	1-
JUNC FILI	1-
SALI HERB	1-
SCAP HYPE	-1
SOLE SPNA	-1
POLY PILI	-1
LOPH WENZ	-1
EMPE HERM	-1

Table 11 Racomitrium-Stereocaulon *type RS*

	1	1	1	1	1	1	1		
Quadrat no.	1	2	6	1	1	1	5		
Anal. nr.	6	1	3	1	3	4	5	F %	C
RACO CANE	5	1	4	3	4	3	4	100.0	3.4
STER GLAE	1	3	1	4	4	4	5	100.0	3.1
AGRO MERT	1	1	-	1	1	1	1	85.7	1.0
POHL FILU	1	4	2	1	-	1	1	85.7	1.7
SALI NIGR	-	1	1	1	1	1	1	85.7	1.0
HEPA TSPP	1	-	-	4	4	5	3	71.4	3.4
STER GRAN	1	-	1	1	1	-	-	57.1	1.0
LUZU SPIC	-	-	-	1	1	1	-	42.9	1.0
PHLE ALPI	-	-	-	1	1	1	-	42.9	1.0
POLY PILI	-	-	-	1	1	1	-	42.9	1.0
BETU PUBE	-	1	-	-	-	-	1	28.6	1.0
BLAS PUSI	-	1	-	-	-	-	1	28.6	1.0
DESC ALPI	-	-	-	-	1	1	-	28.6	1.0
PELT POLY	1	-	-	1	-	-	-	28.6	1.0

Species in addition. - Arter itillegg:
116: CLAD SPP., LOTU CORN, OXYRDIGY,
2113: POAA LPIN, POAA NNUA, POAF LEXU,
163: POLY COMM, 155: SOLO CROC

Table 12 Salix-Pohlia-Racomitrium *type SPR.*

Quadrat no. / Anal. nr.		170	54	59	61	62	63	64	66	67	68	69	70	71	72	73	74	75	76	151	158	F %	C
SALI	NIGR	2	4	3	4	5	5	5	5	5	5	5	5	5	5	5	3	4	5	2	5	100.0	4.4
SALI	GLAN	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	100.0	1.2
SALI	LAPP	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	100.0	1.2
AGRO	MERT	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	95.0	1.0
RACO	CANE	4	5	5	5	5	5	4	5	4	3	4	4	4	4	4	4	4	4	-	5	95.0	4.3
POHL	FILU	3	-	1	4	2	-	3	3	3	3	2	1	1	1	2	1	4	4	1	2	90.0	2.3
BETU	PUBE	1	1	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	85.0	1.0
PHLE	ALPI	1	-	1	1	1	1	1	1	1	1	1	1	1	1	1	-	1	1	-	1	85.0	1.0
BLAS	PUSI	1	-	1	1	-	-	1	3	4	2	2	2	2	2	2	2	1	1	-	1	80.0	1.8
SORB	AUCU	-	-	1	1	1	1	1	1	-	1	1	1	1	1	1	1	1	1	-	-	75.0	1.0
DESC	ALPI	-	-	-	1	1	1	-	-	1	-	1	-	-	1	1	-	1	1	1	1	55.0	1.0
DESC	CESP	1	1	-	-	-	-	1	-	-	1	1	1	-	1	1	1	1	-	-	1	55.0	1.0
LOTU	CORN	-	1	1	-	1	-	1	1	-	-	1	1	1	-	-	-	1	1	-	1	55.0	1.0
POLY	COMM	-	1	1	1	2	1	1	1	1	-	-	-	-	1	1	-	-	-	-	-	50.0	1.1
CARE	NIGR	1	-	-	-	-	1	1	1	1	1	1	-	-	-	1	-	-	-	-	-	40.0	1.0
DESC	FLEX	-	-	1	-	-	1	-	1	-	1	-	1	-	-	1	-	-	1	-	1	40.0	1.0
LUZU	SPIC	1	1	1	-	-	-	-	1	-	-	-	1	1	-	-	-	1	1	-	-	40.0	1.0
LUZU	SUDE	1	-	1	1	1	1	-	1	-	-	-	1	1	-	-	-	-	-	-	-	40.0	1.0
PING	VULG	-	-	-	-	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	40.0	1.0
EMPE	HERM	-	-	1	-	-	1	-	1	-	-	-	1	1	1	1	-	-	-	-	-	35.0	1.0
FEST	VIVI	1	1	-	1	1	-	-	-	1	-	-	-	-	-	1	-	1	-	-	-	35.0	1.0
HEPA	TSPP	1	1	2	-	-	-	-	-	-	-	-	1	-	1	1	-	2	-	-	-	35.0	1.3
OXYR	DIGY	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	2	35.0	1.1
PYRO	MINO	-	1	-	1	1	1	1	1	-	-	1	-	-	-	-	-	-	-	-	-	35.0	1.0
MARS	SPP.	-	1	1	-	-	-	-	-	-	-	-	1	-	1	1	-	2	-	-	-	30.0	1.2
VACC	MYRT	-	-	-	-	-	-	-	-	1	-	-	1	1	1	1	-	1	-	-	-	30.0	1.0
VACC	ULIG	1	-	-	-	-	1	-	1	1	-	-	1	1	-	-	-	-	-	-	-	30.0	1.0
ERIO	ANGU	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	25.0	1.0
JUNC	FILI	1	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	1	25.0	1.0
BART	ALPI	-	-	-	-	-	1	1	-	-	-	-	-	-	1	1	-	-	-	-	-	20.0	1.0
DREP	UNCI	-	-	-	-	-	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-	20.0	1.3
EQUI	ARVE	-	-	1	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1	-	20.0	1.0
CALA	PURP	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	15.0	1.0
CORA	TRIF	-	-	-	-	-	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	15.0	1.0
NARD	STRI	-	-	1	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	15.0	1.0
STER	SPP.	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	15.0	1.0
CARE	BRUN	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	10.0	1.0
GNAP	NORV	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.0	1.0
PELT	SPP.	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	10.0	1.0
POAA	LPIN	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	10.0	1.0

Species in addition. - Arter i tillegg:

46: AGRO CANI, 170: ALNU INCA, ANTH JURA, CARE CANE, CLAD SPP., JUNC TRIF, SPHA SQUA, SPHA SPP., SAXI STEL, POLY SEXA, NARD SCAL, PHIL TOME, 95: EUPH FRIG, 95: POAF LEXU, 36: POTE EREC

Table 13 Salix-Carex nigra *type SCn.*

															1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2							1		
Quadrat no.	2	2	3	3	3	3	3	3	3	3	3	4	4	4	2	2	3	7	7	7	7	7	7	8	8	8	8	9	1	2	2	2	2	4	2	2	2	3	4	4	8		
Anal. nr.	5	9	0	1	2	4	5	6	7	8	9	1	2	3	6	9	0	4	5	6	7	8	9	0	7	8	9	3	0	5	6	7	9	7	6	7	8	3	5	6	3	F %	D
SALI NIGR	4	2	3	3	3	5	2	3	3	2	2	1	2	2	2	2	2	4	1	4	3	3	4	2	5	1	1	-	2	1	2	2	2	2	3	3	4	2	2	4	2	97.5	2.5
EQUI ARVE	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	1	1	2	2	1	1	2	5	3	4	3	-	1	1	1	1	1	1	1	1	1	1	1	1	95.1	1.3
POHL FILU	3	4	5	4	3	4	4	5	4	5	5	5	4	5	4	5	5	1	4	4	4	5	5	5	2	4	4	3	4	3	4	5	4	2	-	1	1	-	3	1	1	95.1	3.6
CARE NIGR	2	1	2	3	2	1	2	2	2	2	1	3	2	2	-	1	1	1	1	1	1	1	2	2	-	1	2	1	-	3	1	2	2	2	2	2	2	2	2	2	2	92.6	1.7
SALI LAPP	1	3	3	3	3	1	4	3	4	4	4	3	4	3	2	1	1	2	2	2	2	2	3	2	1	-	-	-	2	1	2	2	4	3	4	2	3	3	4	3	1	92.6	2.5
BLAS PUSI	2	4	3	4	2	3	4	2	2	2	2	4	2	2	2	3	3	-	-	2	2	3	4	4	2	4	3	-	1	-	2	2	4	1	4	4	4	-	1	1	2	87.8	2.6
RACO CANE	1	4	3	4	2	-	4	3	1	1	2	1	4	4	1	1	3	1	2	3	3	1	1	1	-	1	1	-	2	-	-	-	4	5	1	2	1	1	5	5	3	85.3	2.3
AGRO MERT	1	1	1	1	1	-	2	2	2	1	1	1	2	2	2	1	2	-	1	1	1	-	-	-	-	-	-	-	1	2	2	2	2	1	1	1	1	1	1	1	-	75.6	1.3
DESC CESP	1	-	1	1	-	1	1	1	1	1	1	-	-	-	1	1	1	-	-	-	1	1	1	1	1	3	3	1	1	-	1	1	1	1	2	2	1	1	-	-	1	73.1	1.2
ERIO ANGU	1	1	1	1	2	2	1	1	1	2	1	2	1	1	-	1	-	1	1	1	-	2	2	1	-	-	-	-	-	-	-	-	1	2	1	1	1	1	1	1	1	73.1	1.2
PHLE ALPI	1	1	1	1	-	-	1	1	1	1	1	-	1	1	1	-	-	1	-	1	1	1	-	1	-	1	-	-	1	-	-	-	1	1	1	1	1	1	1	1	1	68.2	1.0
JUNC FILI	-	-	-	-	1	1	1	1	1	1	1	1	-	1	-	1	1	-	-	-	1	-	1	1	-	-	-	-	1	1	1	1	1	-	-	-	-	1	-	-	1	51.2	1.0
ALNU INCA	3	2	2	3	4	1	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2	2	4	4	3	2	2	-	-	-	-	-	-	-	4	4	4	4	-	-	3	48.7	2.8
POLY COMM	-	-	-	-	1	-	1	2	2	2	1	2	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	4	3	3	1	1	1	4	43.9	1.7
CARE ROST	2	1	-	1	1	-	-	1	1	-	1	-	1	1	-	-	-	-	-	-	1	3	2	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	41.4	1.3
SALI GLAN	1	1	1	1	1	1	-	-	1	1	1	-	-	-	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	1	-	39.0	1.1
BETU PUBE	-	-	-	-	-	-	-	-	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	2	1	1	2	1	1	1	36.5	1.1
HEPA TSPP	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	-	-	-	-	4	-	-	-	1	1	-	-	-	2	-	-	1	36.5	1.2
PYRO MINO	-	1	-	-	1	-	-	1	1	-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	1	1	1	1	-	34.1	1.0
CARE CANE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1	1	-	1	1	1	-	-	-	-	-	-	1	1	1	1	1	-	1	31.7	1.0
POAA NNUA	1	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	1	-	-	-	-	-	-	1	1	1	-	1	-	1	31.7	1.0
PING VULG	1	-	1	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	1	1	-	-	26.8	1.0
DREP UNCI	-	-	-	-	1	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1	3	1	-	1	1	24.3	1.4
LUZU SUDE	-	-	1	1	-	-	-	-	-	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-	24.3	1.0
DESC ALPI	-	1	1	1	-	-	-	-	-	-	1	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	19.5	1.0
PHIL TOME	1	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	1	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-	19.5	1.2
CALL STRA	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	1	14.6	1.0
SCAP SPP.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	1	-	1	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	14.6	1.5
SPHA SPP.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	3	1	-	1	-	14.6	1.8
BRYU SPP.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	12.2	1.0
SORB AUCU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-	12.2	1.0
VACC ULIG	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1	1	-	-	-	-	12.2	1.0
POTE EREC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	1	1	-	-	9.7	1.0
VACC MYRT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	1	-	-	9.7	1.0
VIOL PALU	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	1	-	-	-	9.7	1.0
CEPH BICU	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3	1.0
NARD GEOS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	7.3	1.0
RANU ACRI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3	1.0
SALI HERB	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3	1.0
TRIE EURO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	-	-	7.3	1.0
AGRO CANI	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.0

continue

***Table 13** continue*

															1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2							1		
Quadrat no.	2	2	3	3	3	3	3	3	3	3	3	4	4	4	2	2	3	7	7	7	7	7	7	8	8	8	8	9	1	2	2	2	2	4	2	2	2	3	4	4	8		
Anal. nr.	5	9	0	1	2	4	5	6	7	8	9	1	2	3	6	9	0	4	5	6	7	8	9	0	7	8	9	3	0	5	6	7	9	7	6	7	8	3	5	6	3	F %	D
AGRO CANI	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.0
CALA PURP	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	4.8	1.0
CARE ECHI	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	4.8	1.0
CERA PURP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.0
CORA TRIF	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	4.8	1.0
DITR PUSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.0
EMPE HERM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	4.8	1.0
EPIL ANAG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.0
HYLO SPLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	4.8	1.0
KIAE GLAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.0
MELA PRAT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	4.8	1.0
NARD STRI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	4.8	1.5
POHL FILS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	2	-	-	-	-	-	-	-	4.8	3.0
POHL WAHL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.0
RHYT SQUA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4.8	2.0
SALI GLAU	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	4.8	1.0
SAXI STEL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.0
SCAP SUBA	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	4.8	1.0
SPHA GIRG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	4.8	1.0
STEL NEMO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.0
STER GLAE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.8	1.5

Species in addition. - Arter i tillegg: 247: AGRO CAPI, LUZU FRIG, NARD COMP, 176: ANTH JURA, MARC ALPE, POLY PILI, SOLE SPNA, STER SPP., 130: CARE RUFI, LEON AUTU, 175: CEPH SPP., 33: CHIL POLY, HARP FLOT, LOPH WENZ, PELL SP., RHIZ PSEU, TRIT QUIN, 178: ERIO SCHE, POHL CRUD, 227: GNAP SUPI, 25: PHIL SERI, 179: POHL BULB, POHL DRUM, SCAP OBCO, 183: POTE PALU, 32: LOPH ALPE

Table 14 Salix-Nardus stricta *type SNs.*

		1	1					1		
Quadrat no.		7	7	4	4	4	5	7		
Anal. nr.		1	3	7	8	9	0	2	F %	C
VACC	ULIG	2	3	3	1	2	1	4	100.0	2.3
SALI	GLAU	1	2	2	3	2	3	2	100.0	2.1
NARD	STRI	1	1	2	1	2	2	3	100.0	1.7
SALI	LAPP	4	3	1	1	1	2	1	100.0	1.9
ALNU	INCA	1	2	1	1	1	1	3	100.0	1.4
BETU	PUBE	3	1	1	1	1	1	1	100.0	1.3
VAHL	ATRO	1	1	2	1	1	1	2	100.0	1.3
JUNC	FILI	1	1	1	1	1	1	1	100.0	1.0
AGRO	MERT	1	1	1	1	1	1	1	100.0	1.0
VIOL	PALU	1	1	1	1	1	1	1	100.0	1.0
CARE	NIGR	1	1	1	1	2	1	1	100.0	1.1
POLY	COMM	4	4	4	3	4	5	-	85.7	4.0
RACO	CANE	3	4	4	4	2	4	-	85.7	3.5
DREP	UNCI	2	1	4	5	3	-	5	85.7	3.3
EMPE	HERM	1	2	2	2	1	-	4	85.7	2.0
PING	VULG	1	1	1	1	1	-	1	85.7	1.0
POTE	EREC	1	-	1	2	1	1	1	85.7	1.2
SALI	NIGR	2	2	-	-	1	1	2	71.4	1.6
PLEU	SCHR	2	1	4	2	1	-	-	71.4	2.0
LUZU	SUDE	1	-	1	1	1	1	-	71.4	1.0
ERIO	ANGU	-	-	2	1	2	1	1	71.4	1.4
DESC	CESP	1	1	1	-	1	1	-	71.4	1.0
CALL	VULG	1	-	1	2	1	-	1	71.4	1.2
TRIE	EURO	-	-	1	1	1	1	1	71.4	1.0
CARE	ECHI	-	-	1	1	1	1	1	71.4	1.0
VACC	MYRT	1	1	1	1	-	-	-	57.1	1.0
PHLE	ALPI	1	1	1	-	-	1	-	57.1	1.0
DESC	FLEX	1	-	-	1	1	-	-	42.9	1.0
SCIR	CAES	-	-	-	1	1	1	-	42.9	1.0
HEPA	TSPP	1	1	-	-	-	-	1	42.9	1.0
POHL	FILU	-	-	-	-	1	1	-	28.6	1.0
EQUI	ARVE	1	1	-	-	-	-	-	28.6	1.0
ANTH	ODOR	1	1	-	-	-	-	-	28.6	1.0
SALI	GLAN	1	1	-	-	-	-	-	28.6	1.0
LOTU	CORN	1	1	-	-	-	-	-	28.6	1.0
CLAD	SPP.	-	-	-	1	1	-	-	28.6	1.0
SALI	HERB	-	-	-	-	1	-	1	28.6	1.0
SPHA	SPP.	-	-	-	1	1	-	-	28.6	1.0
CARE	BRUN	-	-	1	-	-	1	-	28.6	1.0
BLAS	PUSI	-	-	-	-	1	1	-	28.6	1.0
PYRO	MINO	1	1	-	-	-	-	-	28.6	1.0
VACC	VITI	1	-	-	-	-	-	1	28.6	1.0

Species in addition. - Arter i tillegg:171: EPIL ANAG, SORB AUCU, LIST CORD, FEST VIVI, LUZU PILO, HUPE SELA, 173: EUPH FRIG, AGRO CAPI, CORA TRIF, DESC ALPI

Table 15 Salix-Carex rostrata *type SCr.*

		1					1	1	1	2					
Quadrat no.		8	7	7	8	8	6	6	8	0	8	8	8		
Anal. nr.		2	8	9	0	1	7	9	4	1	2	3	4	F %	D
CARE	ROST	2	5	4	5	4	3	4	3	3	3	3	3	100.0	3.5
SALI	LAPP	1	3	5	3	3	3	3	1	5	1	1	1	100.0	2.5
SALI	NIGR	1	4	2	1	3	3	4	2	1	1	1	1	100.0	2.0
ERIO	ANGU	1	1	1	1	1	1	2	2	1	1	1	1	100.0	1.2
DREP	UNCI	1	2	1	1	-	2	5	-	2	3	1	1	83.3	1.9
CALL	STRA	-	4	1	1	2	2	-	1	-	4	4	5	75.0	2.7
EQUI	ARVE	1	1	3	1	3	3	-	1	2	-	1	-	75.0	1.8
SPHA	SQUA	-	1	1	1	1	3	2	4	2	-	-	-	66.7	1.9
ALNU	INCA	2	1	1	-	-	1	-	1	1	-	-	-	50.0	1.2
PHIL	TOME	1	1	-	1	-	-	1	-	-	1	-	-	41.7	1.0
CARE	NIGR	-	-	-	-	-	1	-	-	-	1	2	1	33.3	1.3
JUNC	FILI	-	-	-	-	-	1	-	-	-	1	1	1	33.3	1.0
SPHA	SPP.	-	-	1	1	-	2	-	-	-	2	-	-	33.3	1.5
RACO	CANE	-	-	-	2	-	-	-	-	-	1	1	1	33.3	1.3
HEPA	TSPP	1	1	1	1	-	-	-	-	-	-	-	-	33.3	1.0
CARE	CANE	-	-	-	-	-	-	-	1	-	1	1	2	33.3	1.3
CARE	SP.	-	-	-	-	-	-	-	-	-	1	1	1	25.0	1.0
SPHA	RIPA	-	1	-	1	1	-	-	-	-	-	-	-	25.0	1.0
SPHA	GIRG	-	1	1	-	-	-	2	-	-	-	-	-	25.0	1.3
DESC	CESP	-	1	-	1	-	-	1	-	-	-	-	-	25.0	1.0
SCAP	IRRI	-	1	1	1	-	-	-	-	-	-	-	-	25.0	1.0
CARE	MAGE	-	-	-	-	-	-	-	-	-	1	1	1	25.0	1.0
BETU	PUBE	2	1	-	-	-	-	-	-	-	-	-	-	16.7	1.5
SCAP	UNDU	-	1	1	-	-	-	-	-	-	-	-	-	16.7	1.0
EQUI	PALU	1	-	-	-	-	-	-	1	-	-	-	-	16.7	1.0
BLAS	PUSI	1	-	-	-	-	-	1	-	-	-	-	-	16.7	1.0
CALL	CORD	1	1	-	-	-	-	-	-	-	-	-	-	16.7	1.0
PELL	SP.	1	-	1	-	-	-	-	-	-	-	-	-	16.7	1.0
RHYT	SQUA	-	1	-	1	-	-	-	-	-	-	-	-	16.7	1.0
DREP	EXAN	-	1	-	1	-	-	-	-	-	-	-	-	16.7	1.0
SALI	GLAN	-	1	-	1	-	-	-	-	-	-	-	-	16.7	1.0
POHL	WAHL	-	1	1	-	-	-	-	-	-	-	-	-	16.7	1.0

Species in addition. - Arter i tillegg
80: RHIZ PSEU,CARE JUNC, SCAP PALU, NARD SCAL, SCAP SUBA, SPHA PALU, HARP FLOT, POHL DRUM, 184: POTE PALU, 169: EQUI FLUV, 182: DITR PUSI, SCAP HYPE, POHL FILU, BRAC MILD, 201: SALI GLAU

5.1.13 *Salix - Philonotis tomentella* type SPt (group 01111) Table 16

This type is characterised by a low sparse shrub layer of *Salix nigricans*, *S. glandulifera*, *S. lapponum* and *Alnus incana*. The field layer is also sparse, with scattered plants of *Phleum alpinum*, *Juncus filiformis* and *Deschampsia cespitosa*. The bottom layer, in contrast, is dense and dominated by *Philonotis tomentella*, *Sphagnum* spp., *Racomitrium canescens* and *Calliergon stramineum*.

The stands are mostly found as narrow borders on riverbanks, and are, therefore, constantly wet. Their main distribution is in the middle and northern part of the sandur where the rivers are flowing fast. The sediments are mainly coarse due to erosion and little sedimentation.

5.1.14 *Alnus incana - Deschampsia cespitosa* type ADc (group 10) Table 17

The stands within this type have a 7-10 m high tree layer dominated by *Alnus incana*, more rarely by *Salix nigricans* or *Betula pubescens*. Below, the shrub layer is often quite dense, and dominated by *Salix nigricans*. The field layer covers 80-100 %, and *Deschampsia cespitosa* is the dominant species. *Carex rostrata*, *Equisetum sylvaticum* and *Calamagrostis purpurea* may be dominant locally. Other common species are *Salix lapponum*, *Phleum alpinum*, *Equisetum arvense*, *Carex nigra*, *Pyrola minor* and *Trientalis europaea*. The bottom layer is variable, but often dominated by *Rhytidiadelphus squarrosus*. Other common bryophytes are *Polytrichum commune*, *Brachythecium rutabulum*, *B. reflexum* and *B. salebrosum*.

These communities are always found on fine-graded sediments, and usually high above the water-level. Their main distribution is in the southern part of the sandur, decreasing rapidly towards the north. They may be found as far as 2 km from the outlet.

Some of the stands are obviously highly influenced by grazing, e.g. the 8 first quadrats in **Table 17**. In the southwestern part of the sandur *Ranunculus acris* and *Poa annua* are common. High frequencies of *Blasia pusilla* and *Pohlia filum* indicate erosion, probably caused by trampling. In these stands the shrub layer is scarce or absent. In quadrats which have not been so intensively grazed, species such as *Angelica sylvestris*, *Cicerbita alpina*, and *Milium effusum* are more frequent.

Table 16 Salix-Philonotis tomentella *type SPt.*

Quadrat no. / Anal. nr.	207	208	263	264	267	F %	D
PHIL TOME	5	4	4	5	1	100.0	3.8
SALI NIGR	3	3	3	4	5	100.0	3.6
SALI LAPP	4	4	1	1	2	100.0	2.4
RACO CANE	3	3	1	1	1	100.0	1.8
ALNU INCA	1	2	1	1	2	100.0	1.4
SPHA SQUA	2	2	1	1	1	100.0	1.4
DESC CESP	1	1	2	1	1	100.0	1.2
PHLE ALPI	1	1	1	-	1	80.0	1.0
CALL STRA	2	1	3	2	-	80.0	2.0
SCAP SPP.	1	-	2	1	1	80.0	1.3
JUNC FILI	1	-	1	1	1	80.0	1.0
SALI GLAN	1	1	-	2	2	80.0	1.5
AGRO MERT	1	1	1	-	-	60.0	1.0
LOPH SPP.	-	-	1	1	1	60.0	1.0
CARE CANE	1	1	-	1	-	60.0	1.0
SPHA GIRG	1	1	-	-	1	60.0	1.0
BETU PUBE	1	1	-	-	1	60.0	1.0
AGRO CANI	-	-	1	-	1	40.0	1.0
PHIL TOMS	-	-	4	1	-	40.0	2.5
SPHA COMP	2	2	-	-	-	40.0	2.0
SPHA LIND	3	3	-	-	-	40.0	3.0
SPHA RUSS	1	1	-	-	-	40.0	1.0
SAXI STEL	1	1	-	-	-	40.0	1.0
HEPA TSPP	1	-	1	-	-	40.0	1.0
LUZU SUDE	1	1	-	-	-	40.0	1.0
CARE NIGR	1	1	-	-	-	40.0	1.0
CALA PURP	1	-	-	-	1	40.0	1.0

Species in addition. - Arter i tillegg:
267: SORB AUCU, HUPE SELA, CARE BRUN, PING VULG, POLY JUNI, POAA NNUA, RHIZ PUNC, SPHA NEMO, 207: SPHA RIPA, CARE ROST, SPHA TERE, OXYR DIGY, CARE LACH, DESC FLEX, LUZU SPIC, EUPH FRIG, SPHA SPP., 208: PYRO MINO

Table 17 Alnus incana-Deschampsia cespitosa *type ADc*

	1	1			1	1					2						2	2	2	2	2						2			
Quadrat no.	6	8	1	1	8	8		1	1	7	6		2	1	1	1	0	0	2	4	2	1	1		2	2	2	2		
Anal. nr.	8	1	8	9	5	6	7	5	4	7	8	9	0	0	1	2	2	3	1	1	8	3	6	8	2	3	0	1	F %	D
ALNU INCA	5	5	3	4	3	4	5	4	2	2	5	4	5	5	5	5	5	4	4	5	-	5	5	2	5	5	4	3	96.4	4.2
SALI NIGR	-	1	2	1	2	1	1	1	1	3	4	4	2	4	4	5	4	4	3	4	5	2	2	1	2	2	1	4	96.4	2.6
DESC CESP	2	2	2	-	2	-	5	5	4	1	2	4	5	5	5	2	4	3	1	4	4	3	3	4	3	2	2	3	92.9	3.2
RHYT SQUA	2	3	5	5	5	5	1	2	1	1	-	-	-	2	1	1	2	3	-	2	3	4	4	3	3	3	5	3	85.7	2.9
EQUI ARVE	2	1	2	2	2	2	-	1	1	3	-	-	1	-	1	1	1	1	1	1	-	1	-	-	1	1	1	1	75.0	1.3
POLY COMM	-	2	1	1	1	1	-	-	-	-	-	2	1	2	2	2	2	2	2	1	1	1	1	-	1	1	1	1	75.0	1.4
PHLE ALPI	-	1	1	1	1	1	1	1	-	-	1	1	1	1	1	1	-	-	1	-	1	-	1	1	-	1	1	1	71.4	1.0
PYRO MINO	-	1	1	1	1	1	1	-	-	-	2	1	-	2	2	1	1	3	1	1	1	-	1	-	-	1	1	1	71.4	1.3
BETU PUBE	4	1	1	-	1	-	-	-	1	2	1	-	-	1	1	1	1	1	-	-	-	1	1	1	2	2	2	1	67.9	1.4
TRIE EURO	1	1	1	1	1	1	1	1	-	-	1	1	-	1	1	-	-	-	-	-	1	1	-	1	1	2	2	1	67.9	1.1
SALI LAPP	-	1	2	1	2	1	-	-	1	1	4	-	-	1	-	1	2	1	1	1	1	1	-	-	-	-	1	1	64.3	1.3
SORB AUCU	-	-	-	1	-	1	-	-	1	-	1	-	1	1	1	1	1	1	1	-	-	1	1	1	-	1	1	1	60.7	1.0
CARE NIGR	-	1	2	2	2	2	2	-	-	1	-	1	1	1	-	-	-	1	1	1	-	-	-	-	1	-	1	-	53.6	1.3
HEPA TSPP	-	1	2	1	1	-	1	-	1	1	-	-	1	1	1	1	1	1	-	1	-	-	-	-	-	-	-	1	53.6	1.1
RANU ACRI	-	1	1	3	2	3	2	2	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	1	1	1	1	1	50.0	1.6
ATHY FILI	1	-	1	1	1	1	-	1	-	-	-	-	-	-	1	-	-	1	1	-	-	2	-	1	2	1	-	-	46.4	1.2
CARE CANE	1	2	2	1	2	1	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1	46.4	1.2
POAA NNUA	-	2	-	1	-	1	1	1	-	-	1	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-	1	1	46.4	1.1
CALA PURP	4	-	-	-	-	-	-	-	1	1	1	-	-	1	1	-	1	1	-	-	-	-	1	-	2	1	-	2	42.9	1.4
CARE ROST	-	1	-	1	-	-	-	-	2	4	-	1	-	1	1	1	1	1	-	-	-	1	-	-	-	-	-	1	42.9	1.3
DREP UNCI	-	-	-	1	-	1	-	-	-	1	-	1	-	1	2	1	-	-	3	2	2	-	-	1	-	-	-	1	42.9	1.4
VACC MYRT	-	-	1	1	1	1	-	-	-	-	-	-	-	1	1	1	1	1	1	-	-	-	-	-	-	1	1	-	42.9	1.0
VIOL PALU	1	-	1	1	1	1	-	1	-	-	1	-	-	-	-	-	1	1	-	-	1	-	1	-	-	-	-	1	42.9	1.0
ANGE SYLV	-	-	1	-	1	-	-	-	-	-	-	-	1	1	-	-	1	1	1	-	-	1	-	1	-	1	1	-	39.3	1.0
BRAC RUTA	-	-	-	-	-	-	-	-	1	1	-	-	-	1	1	-	1	1	2	-	-	-	-	1	1	-	1	1	39.3	1.1
CICE ALPI	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	-	-	-	-	1	1	1	1	1	39.3	1.0
JUNC FILI	1	1	2	1	2	1	1	-	-	1	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	39.3	1.2
BRAC SALE	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	1	-	-	-	1	1	1	-	1	35.7	1.0
DRYO EXPA	1	-	1	1	1	1	-	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	1	-	-	1	35.7	1.0
RUME ACET	-	-	-	1	-	1	-	1	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	1	-	-	1	-	35.7	1.0
BRAC REFL	-	-	-	-	-	-	-	1	-	-	-	3	1	1	2	-	1	1	-	-	-	-	4	1	-	-	-	-	32.1	1.7
BLAS PUSI	-	4	2	1	2	1	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.6	1.6
EPIL HORN	-	-	-	-	-	-	1	1	-	-	-	-	-	1	1	1	-	-	1	-	-	-	-	-	-	1	-	1	28.6	1.0
LUZU SUDE	-	-	1	1	1	1	-	1	-	-	-	-	1	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	28.6	1.0
PELL SP.	-	-	-	-	-	-	-	-	1	1	-	-	1	1	1	1	-	-	-	1	-	-	-	-	-	-	-	1	28.6	1.0
SPHA SQUA	4	1	-	-	-	-	-	-	1	5	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	1	28.6	1.9
STEL CALY	-	-	1	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	1	1	1	-	-	1	28.6	1.0
MILI EFFU	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	-	-	-	-	-	-	1	-	-	1	1	25.0	1.0
STEL NEMO	1	-	-	-	-	-	-	2	-	-	-	-	-	-	1	-	1	-	1	-	-	-	-	3	2	-	-	-	25.0	1.6
CALL STRA	-	1	1	-	1	-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.4	1.0
CARE BRUN	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	1	-	-	-	-	1	-	-	1	21.4	1.0

continue

***Table 17** continue*

	1	1			1	1					2						2	2	2	2	2						2			
Quadrat no.	6	8	1	1	8	8		1	1	7	6		2	1	1	1	0	0	2	4	2	1	1		2	2	2	2		
Anal. nr.	8	1	8	9	5	6	7	5	4	7	8	9	0	0	1	2	2	3	1	1	8	3	6	8	2	3	0	1	F %	D
MARC ALPE	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	1	1	-	1	-	-	-	-	-	-	1	-	21.4	1.0
POTE PALU	-	-	-	-	1	1	1	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	21.4	1.0
PRUN PADU	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	21.4	1.0
SALI GLAN	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	2	1	-	-	-	-	-	-	1	-	-	21.4	1.3
AGRO CAPI	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	1	1	-	17.9	1.0
EQUI SYLV	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	5	4	17.9	4.0
HYLO UMBR	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	1	17.9	1.0
POAP RATE	-	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	17.9	1.0
SPHA GIRG	-	1	-	-	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	17.9	1.0
AGRO MERT	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	1	-	-	-	-	-	14.3	1.0
ALCH VULG	-	-	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	14.3	1.0
ATHY DIST	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	14.3	1.0
CALL CORD	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	14.3	1.3
CORA TRIF	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	14.3	1.3
DESC FLEX	-	-	1	-	-	-	-	-	-	-	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	14.3	1.0
HYLO SPLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	14.3	1.0
LUZU PILO	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	14.3	1.0
POHL FILU	-	4	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.3	1.8
POLY VIVI	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.3	1.0
RHIZ MAGN	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	1	14.3	1.0
AGRO CANI	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	10.7	1.0
ANGE ARCH	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	10.7	1.0
CERA FONT	-	-	-	1	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	10.7	1.0
DICR FUSC	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	10.7	1.0
HYLO PYRE	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	10.7	1.0
LUZU MULT	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	10.7	1.0
PARI QUAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	10.7	1.0
PHIL TOME	-	-	-	-	-	-	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.7	1.0
POHL SPP.	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	10.7	1.0
POTE EREC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	1	10.7	1.0
RHIZ PUNC	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	10.7	1.0
SCAP SPP.	-	-	1	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.7	1.0
THEL PHEG	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.7	1.0
BARB BARB	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.0
BRAC STAR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	7.1	1.0
CARE JUNC	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.5
CIRR PILI	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	7.1	1.0
ERIO ANGU	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.0
GEUM RIVA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	7.1	1.0
LOPH ALPE	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.0
MELA PRAT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.0

continue

Table 17 continue

	1	1			1	1					2						2	2	2	2	2						2			
Quadrat no.	6	8	1	1	8	8		1	1	7	6		2	1	1	1	0	0	2	4	2	1	1		2	2	2	2		
Anal. nr.	8	1	8	9	5	6	7	5	4	7	8	9	0	0	1	2	2	3	1	1	8	3	6	8	2	3	0	1	F %	D
PLAG ELLI	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.0
POHL DRUM	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.0
RACO CANE	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	7.1	1.0
RANU REPE	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	7.1	1.0
SAXI STEL	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.0
SCIL PALL	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.0
SOLI VIRG	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	1.0
SPHA TERE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	7.1	1.0
VACC ULIG	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	7.1	1.0
VALE SAMB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	7.1	1.0

Species in addition. - Arter i tillegg:
19:BRYU SPP., PHIL SERI, 181: DITR PUSI, 11: DRYO CART, 202: EURH SP. 21: GERA SYLV GNAP NORV, 268: HUPE SELA, POLY JUNI, 221: MELA SYLV, 186: MONT FONT, RIBE UVAC, 228: NARD STRI, 23: OXAL ACET, 241: POHL CRUD, 77: POHL WAHL, PSEU CINC, RHIZ PSEU, 9: RHOD ROSE, 221: SPHA SPP., TARA SPP.

5.1.15 *Alnus incana - Athyrium* type AA (group 11) Table 18

This type is characterised by a high and dense tree layer of *Alnus incana,* while the shrub layer is very sparse. *Athyrium distentifolium* and *A. filix-femina* make a thick, higher field layer. Below the ferns there is a dense cover of *Stellaria nemorum.* Other constant vascular plants are *Ranunculus repens, R. acris, Alchemilla vulgaris, Oxalis acetosella, Trientalis europaea, Viola palustris, Rumex acetosa, Equisetum arvense,* and *Dryopteris expansa.* The bottom layer is sparse, but *Brachythecium reflexum* and *B. salebrosum* are constants. Several species which are very rare in other types, e.g. *Gymnocarpium dryopteris, Oxalis acetosella, Dryopteris carthusiana, Ranunculus repens, Geranium sylvaticum, Thelypteris phegopteris, Pohlia cruda* and *Rhodobryum roseum* occur in these stands.

Type AA has only been found in areas with fine-graded minerogeneic sediments on which a thin layer of humus has developed. The stands are mainly at a high level in relation to the rivers, and the vegetation is therefore not influenced by the daily water-level fluctuations.

The stands are only found in the central parts of the main island in the southern part of the sandur, an area which has been heavily grazed for a long time.

It is probable that the *Alnus-Athyrium* type together with SNS are the vegetation types which have been left undisturbed from erosion for the longest period of time.

Table 18 Alnus incana-Athyrium *type AA.*

Quadrat no.		1	2							
Anal. nr.	6	7	4	5	1	2	3	4	F %	C
ALNU INCA	1	2	2	4	4	5	5	5	100.0	3.5
RANU REPE	1	3	2	1	1	1	1	1	100.0	1.4
DESC CESP	5	1	2	2	1	1	1	1	100.0	1.8
BRAC REFL	2	3	3	2	1	1	1	2	100.0	1.9
STEL NEMO	1	-	2	4	4	5	5	4	87.5	3.6
ATHY DIST	-	1	1	2	5	5	5	5	87.5	3.4
ALCH VULG	2	1	1	1	1	1	1	-	87.5	1.1
BRAC SALE	1	-	-	1	1	1	1	1	75.0	1.0
RHYT SQUA	2	3	3	1	-	-	1	1	75.0	1.8
OXAL ACET	-	1	-	1	1	1	1	1	75.0	1.0
TRIE EURO	1	-	1	1	1	1	-	1	75.0	1.0
RUME ACET	-	-	1	1	1	-	1	1	62.5	1.0
ATHY FILI	-	1	1	4	-	-	1	1	62.5	1.6
DRYO EXPA	-	1	1	1	-	2	1	-	62.5	1.2
RANU ACRI	2	1	1	1	1	-	-	-	62.5	1.2
EQUI ARVE	1	-	-	-	1	1	1	1	62.5	1.0
VIOL PALU	1	1	1	1	-	-	-	1	62.5	1.0
BRAC STAR	1	-	-	1	1	-	-	1	50.0	1.0
POHL CRUD	-	-	-	-	-	1	1	1	37.5	1.0
POAP RATE	1	1	1	-	-	-	-	-	37.5	1.0
DRYO CART	-	-	-	1	1	1	-	-	37.5	1.0
GYMN DRYO	-	-	-	-	1	1	-	1	37.5	1.0
PARI QUAD	-	-	-	1	-	1	1	-	37.5	1.0
THEL PHEG	-	-	-	-	1	-	-	1	25.0	1.0
PHLE ALPI	1	1	-	-	-	-	-	-	25.0	1.0
MILI EFFU	-	-	-	-	1	-	1	-	25.0	1.0
CIRR PILI	-	-	-	-	1	1	-	-	25.0	1.0
BRAC RUTA	1	-	-	-	-	1	-	-	25.0	1.0
RHOD ROSE	-	-	-	-	1	-	-	1	25.0	1.0
MARC ALPE	-	-	1	-	-	-	-	-	12.5	1.0
GERA SYLV	-	-	-	-	-	-	-	2	12.5	2.0
CARE NIGR	-	-	1	-	-	-	-	-	12.5	1.0
HYLO SPLE	-	-	-	-	1	-	-	-	12.5	1.0
CARE CANE	-	-	1	-	-	-	-	-	12.5	1.0
POAA NNUA	1	-	-	-	-	-	-	-	12.5	1.0
SALI NIGR	-	-	-	2	-	-	-	-	12.5	2.0
HEPA TSPP	-	-	1	-	-	-	-	-	12.5	1.0
POHL FILU	-	-	1	-	-	-	-	-	12.5	1.0
CICE ALPI	-	-	-	-	-	-	-	1	12.5	1.0
EQUI SYLV	-	-	5	-	-	-	-	-	12.5	5.0
EPIL HORN	-	1	-	-	-	-	-	-	12.5	1.0
CALA PURP	-	-	-	-	-	-	1	-	12.5	1.0

5.2 Homogeneity and homotoneity of the types

Table 19 shows the frequency and mean abundance for the species within each of the quadrat-groups separated. The species are listed in the same order as in the full TWINSPAN table.

On this active sandur, the analysed quadrats may represent different successional stages or different vegetation zones in relation to water-level. From a phytosociological point of view, it is essential to investigate the uniformity of the different quadrats within each of the TWINSPAN-groups. It is therefore of interest to obtain a measure of the narrowness of definition of the types. This amounts to measuring the uniformity, or homogeneity, of the plots selected for analysis and the uniformity, or homotoneity of vegetation types (Nordhagen 1943, Dahl 1957: 46). In the case of homogeneity different plots of the same size taken from an individual stand are compared, in the case of homotoneity, comparable plots from different stands of the same type are compared. **Table 20** shows the distribution of species in frequency classes within each type. If the number of species in class V is higher than in class IV, the set of samples may represent a uniform vegetation type (Dahl 1960: 806). Another measure of homoteneity is the index of uniformity (Dahl 1960). In **Table 21** this index has been calculated. If the index of uniformity is higher than 1.2, the number of species in class V is expected to be larger than class IV, the ratio increasing with higher values of the index.

Tables 20 and **21** indicate that most of the TWINSPAN-groups separated fulfil the criteria for floristic uniformity, and may therefore represent different vegetation types or well defined successional stages. In types BP and SCr species in class V exceed those in class IV, but the index of uniformity is only 0.7 and 0.9 respectively. SRS and ADc does not fulfil any of the two criterias for uniformity.

Those types with the highest values of index of uniformity are restricted to the most stable parts of the sandur, i.e. at high elevations above the water level, e.g. CPp, SNS, and AA. BP, SRS, and SCr are situated in sites which are highly influenced during flooding, and the vegetation here is therefore affected by erosion or sedimentation. The PE type is also situated close to the water-level, but the vegetation is regularly inundated, and must be re-established each year.

Table 19 *Synopsis of the different vegetation types according to the TWINSPAN classification. Frequency as a percentage first number) and mean cover (last number) of the species are given. - Oversikt over artenes forekomst i de ulike vegetasjonstypene i henhold til TWINSPAN-klassifikasjonen. Frekvensen (i %) og midlere dekningsgrad er angitt.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Type	Rc	CPp	SRS	AS	PE	PB	DS	RS	SPR	SCn	SNs	SCr	SPt	ADc	AA
No of quad.	4	6	30	5	15	53	2	7	20	41	7	12	5	28	8
Analyser															
DESC FLEX		83.1	56.1			6.1			40.1		43.1		20.1	14.1	
SALI GLAN		50.1	74.2		7.1	30.1			100.1	39.1	29.1	17.1	80.2	21.1	
CALL VULG		17.1	27.1								71.1				
EMPE HERM		83.1	67.1			2.1	50.1		35.1	5.1	86.2				
LUZU FRIG			3.1			2.1					2.1				
VACC VITI			9.1								29.1				
ALCH ALPI			3.1												
BART ALPI			24.1					20.1							
DACT MACU			3.1												
LOTU CORN			44.3			8.1		9.1	55.1		29.1				
ORTH SECU			3.1												
PELT APTH			3.1												
PELT CANI			6.1												
PHYL CAER			6.1												
POAV IVIP			6.1												
RACO LANU			12.1												
SALI PHYL			3.2												
SILE RUPE			3.1												
STER SPP.			35.1			6.1	50.1		15.1	2.1					
ANTH ODOR			15.1			2.1					29.1				
SALI HERB		83.1	32.1	20.1			50.1			7.1	29.1				
POLY PILI	100.1	100.2	21.1			15.1	50.1	27.1		2.1					
POLY SEXA			18.1			8.1			5.2						
STER GRAN	50.1	33.1	35.2			4.1		36.1							
ARCT UVAU			3.1												
CEPH SPP.		33.1	3.1												
CETR ISLA		83.1	6.1												
CLAD COCC			9.1												
CLAD MITI	50.1	67.1	9.1												
ALEC SPP.	25.1														
CETR DELI		17.1													
CLAD BELL		83.1													
CLAD CORN		17.1													
CLAD CRIS		33.1													
CLAD DEFO		33.1													
CLAD ECMO		67.1													
CLAD GRAC		50.1													
CLAD MACR		17.1													

continue

Table 19 continue

Type No of quad. Analyser	1 Rc 4	2 CPp 6	3 SRS 30	4 AS 5	5 PE 15	6 PB 53	7 DS 2	8 RS 7	9 SPR 20	10 SCn 41	11 SNs 7	12 SCr 12	13 SPt 5	14 ADc 28	15 AA 8
CLAD PHYL		17.1													
CLAD PITY		17.1													
CLAD PLEU		67.1													
CLAD PYXI		50.1													
CLAD RANG		50.1													
CLAD STRI		17.1													
CLAD UNCI		50.1		20.1											
CLAD VERT		17.1													
GYMN CONC		33.1													
HIER SPP.		17.1													
KIAE STAR		83.3	3.1	40.1											
LECI GRAN		83.1													
LEPR NEGL		33.1													
MARS EMAR		83.2		60.1											
MASS CARN	50.1														
POHL NUTA	50.1	50.1					100.1								
POLY ALPI		33.1													
RACO AFFI		50.1													
SOLO CROC		33.1						9.1							
STER RIVU	50.1	17.2													
STER TOME		33.1													
LUZU SPIC			56.1	80.1		36.1	100.1	27.1	40.1				20.1		
ORTH FLOE			3.1												
POAA LPIN			12.1			9.1		9.1	10.1						
RACO CANE	100.5	100.2	88.5	100.1	7.1	81.2	100.3	64.3	95.4	85.2	86.4	33.1	100.2	7.1	
HEPA TSPP	50.1	83.3	53.1	100.5	7.1	53.1	100.5	46.3	35.1	37.1	43.1	33.1	40.1	54.1	8.1
JUNC TRIF			3.1			2.1			5.1						
POGO URNI			3.1	20.1		2.1									
FEST VIVI	25.1		18.1			8.1			35.1		14.1				
PELT SPP.			3.1			2.1			10.1						
EUPH FRIG			3.1						5.1		14.1		20.1		
MARS SPP.			6.2						30.1						
PING VULG			27.1	20.1		2.1			40.1	27.1	86.1		20.1		
CARE SPP.			3.1									25.1			
SCIR CAES			3.1								43.1				
VAHL ATRO			9.1								100.1				
OXYR DIGY			38.1	80.2		49.1		9.1	35.1				20.1		
JUNC ALPI					60.1										
POAF LEXU			9.1		7.1	13.1		9.1	5.1						
STER GLAE	50.1		9.2			21.1	50.1	64.3		5.2					

continue

Table 19 continue

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Type	Rc	CPp	SRS	AS	PE	PB	DS	RS	SPR	SCn	SNs	SCr	SPt	ADc	AA
No of quad.	4	6	30	5	15	53	2	7	20	41	7	12	5	28	8
Analyser															
AGRO MERT		67.1	76.1	80.1	60.1	89.1	100.1	55.1	95.1	76.1	100.1		60.1	14.3	
ANTH JURA						2.1			5.1	2.1					
DESC ALPI			21.1	40.1	40.1	51.1		18.1	55.1	20.1	14.1				
SAGI SAGI						2.1									
SCAP SPP.				100.1		13.1	100.1			15.2			80.1	11.1	
DITR PUSI				40.1		13.1				5.1		8.1		4.1	
SAXI STEL				80.1		45.1	100.1		5.1	5.1			40.1	7.1	
AULA PALU						4.1									
CARE BIGE															
CARE RUFI			3.1	20.1		21.1	100.1			2.1					
CEPH BIAM				60.1		9.1	100.3								
CERA CERA			6.1			43.1									
DICR SUBU							100.3								
EPIL ANAG			3.1			19.1				5.1	14.1				
LOPH INCI															
NARD GEOS				40.1		13.1	100.1			7.1					
OLIG HERC			3.1	40.1	7.1	9.1	100.1								
PELT POLY								18.1							
POAG LAUC						6.1									
POHL FILS			3.2		20.3	30.3				5.3					
POHL OBTU															
RANU GLAC				20.1		2.1									
SCAP CURT						8.1	100.1								
SCAP OBCO				20.1		9.1	100.3			2.1					
SILE ACAU						2.1									
SPHA MAGE						2.1									
ANTH JULA				100.3		2.1									
BLIN ACUT				40.1											
CALL SARM				80.1		2.1									
CARD BELL				20.1											
CEPH BIBI				20.1											
CEPH LUNU				60.1											
DICR PALU				40.1											
DREP EXAP				80.1											
HYGR TAXI				100.1											
LOPH WENZ				60.1						2.1					
MARS SPAR				40.1											
MARS SPHA				100.1											
MOER BLYT				20.1											
NARD COMP				100.2						2.1					

continue

***Table 19** continue*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Type	Rc	CPp	SRS	AS	PE	PB	DS	RS	SPR	SCn	SNs	SCr	SPt	ADc	AA
No of quad.	4	6	30	5	15	53	2	7	20	41	7	12	5	28	8
Analyser															
NARD SCAL				100.1	7.1	2.1			5.1	5.1		8.1			
PLEU ALBE				80.1											
RACO ACIC				20.1											
RICC PING				20.1											
SCAP HYPE				60.1			100.1					8.1			
SCAP IRRR				20.1											
SCAP OBSC				80.1											
SCAP SUBA				100.1		4.1						8.1			
SCAP ULIG				100.3											
SCAP UNDU				100.2								17.1			
SOLE SP.				40.1		2.1									
SOLE OBOV				60.1											
SOLE SPNA				80.1			50.1			2.1					
SOLE SUBE				60.1											
SPHA AUAU				80.1											
ERIO SCHE				20.1	53.1	2.1				2.1					
CEPH SPP.				20.1		2.1				2.1					
KIAE GLAC						2.1				5.1					
POHL BULB					7.1					2.1					
POHL FILU	50.1		24.1	20.1	100.3	100.5	100.1	55.2	90.2	95.4	29.1	8.1		14.2	8.1
CARE LACH													20.1		
PHIL TOME				100.1	13.1	45.2	100.1		5.2	20.1		42.1	100.4	11.1	
SCAP IRRI				80.1								25.1			
NARD STRI			6.1						15.1	5.2	100.2			4.1	
CLAD SPP.								9.1	5.1		29.1				
CARE ECHI										5.1	71.1				
LIST CORD											14.1				
PLEU SCHR											71.2				
SALI GLAU										5.1	100.2	8.1			
BRAC MILD												8.1			
CARE MAGE												25.1			
DREP EXAN												17.1			
EQUI FLUV												8.1			
LOPH SPP.				20.1									60.1		
PHIL TOMS												40.3			
SCAP PALU												8.1			
SPHA COMP													40.2		
SPHA LIND													40.3		
SPHA NEMO													20.1		
SPHA PALU												8.1			

continue

Table 19 continue

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Type	Rc	CPp	SRS	AS	PE	PB	DS	RS	SPR	SCn	SNs	SCr	SPt	ADc	AA
No of quad.	4	6	30	5	15	53	2	7	20	41	7	12	5	28	8
Analyser															
SPHA RIPA												25.1	20.1		
SPHA RUSS													40.1		
EQUI PALU												17.1			
HARP FLOT				20.1						2.1		8.1			
ERIO ANGU		17.1	3.1		20.2	6.1			25.1	73.1	71.1	100.1		7.1	
CEPH BICU										7.1					
CERA PURP										5.1					
CHIL POLY										2.1					
GNAP SUPI										2.1					
JUNC ARTI															
LEON AUTU										2.1					
TRIT QUIN										2.1					
BLAS PUSI			21.1		33.1	76.2		18.1	80.2	88.3	29.1	17.1		29.2	
BRYU SPP.					13.1	4.1				12.1				4.1	
CALL STRA				60.1	13.1	11.1				15.1		75.3	80.2	21.1	
SPHA SPP.						2.1			5.1	15.2	29.1	33.2	20.1	4.1	
POTE EREC			12.1						5.1	10.1	86.1			11.1	
SALI LAPP		33.1	71.2	100.1		45.1	100.1		100.1	93.3	100.2	100.3	100.2	64.1	
VACC ULIG			35.1						30.1	12.1	100.2			7.1	
BETU PUBE		100.1	71.2	20.1		13.1	100.1	18.1	85.1	37.1	100.1	17.2	60.1	70.1	
HUPE SELA			6.1								14.1		20.1	4.1	
POLY JUNI			3.1			4.1							20.1	4.1	
VACC MYRT		50.1	65.1			4.1			30.1	10.1	57.1			43.1	
AGRO CANI	25.1		3.1			4.1			5.1	5.1			40.1	11.1	
LUZU SUDE			27.1			11.1	100.1		40.1	24.1	71.1		40.1	29.1	
PHLE ALPI	25.1		62.1		27.1	55.1		27.1	85.1	68.1	57.1		80.1	71.1	17.1
SALI NIGR	25.1	100.1	85.2		87.1	89.1	100.1	55.1	100.4	98.3	71.2	100.2	100.4	96.3	8.2
CARE ROST										42.1		100.4	20.1	43.1	
EQUI ARVE			3.1		87.3	19.1			20.1	95.1	29.1	75.2		75.1	42.1
POHL DRUM				60.1		2.1	100.1			2.1		8.1		7.1	
POHL WAHL						4.1				5.1		17.1		4.1	
CARE NIGR			21.1		67.1	8.1			40.1	93.2	100.1	33.1	40.1	54.1	8.1
JUNC FILI			6.1		13.1	13.1	50.1		25.1	51.1	100.1	33.1	80.1	39.1	
DREP UNCI			3.2			9.1	100.1		20.1	24.1	86.3	83.2		43.1	
GNAP NORV						2.1			10.1					4.1	
POLY COMM			24.1	40.1		19.1	100.1	9.1	50.1	44.2	86.4			75.1	
CARE CANE				20.1	33.1	15.1			5.1	32.1		33.1	60.1	46.1	8.1
PHIL SERI						2.1				2.1				4.1	
POAA NNUA					33.1	9.1		9.1		32.1			20.1	46.1	8.1
RHIZ PSEU										2.1		8.1		4.1	

continue

***Table 19** continue*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Type	Rc	CPp	SRS	AS	PE	PB	DS	RS	SPR	SCn	SNs	SCr	SPt	ADc	AA
No of quad.	4	6	30	5	15	53	2	7	20	41	7	12	5	28	8
Analyser															
SPHA GIRG				20.1						5.1		25.1	60.1	18.1	
SPHA SQUA						2.1			5.1			67.2	100.1	29.2	
CARE JUNC												8.1		7.2	
PHIL FONT															
MELA PRAT										5.1				7.1	
LOPH ALPE	50.1			20.1		2.1	100.1			2.1				7.1	
MONT LAMP				20.1										4.1	
POLY VIVI			6.1											14.1	
CORA TRIF									15.1	5.1	14.1			14.1	
SORB AUCU			15.1						75.1	12.1	14.1		20.1	61.1	
AGRO CAPI			3.1							2.1	14.1			18.1	
CARE BRUN			12.1			2.1			10.1		29.1		20.1	21.1	
PYRO MINO			32.1						35.1	34.1	29.1		20.1	71.1	
ALNU INCA									5.1	49.3	100.1	50.1	100.1	96.4	67.4
DESC CESP			21.1		53.1	36.1			55.1	73.1	71.1	25.1	100.1	93.3	67.2
VIOL PALU			3.1							10.1	100.1			43.1	42.1
HYLO SPLE										5.1				14.1	8.1
BRAC REFL														32.2	67.2
CIRR PILI														7.1	17.1
PARI QUAD														11.1	25.1
BRAC RUTA														39.1	17.1
BRAC SALE														36.1	50.1
CICE ALPI														39.1	8.1
EQUI SYLV														18.4	8.5
MILI EFFU														25.1	17.1
DICR FUSC		50.1												11.1	
EPIL HORN			6.1			2.1								29.1	8.1
ANGE ARCH														11.1	
ANGE SYLV														39.1	
BARB BARB														7.1	
CALL CORD												17.1		14.1	
EURH SP.														4.1	
GEUM RIVA														7.1	
HYLO PYRE														11.1	
HYLO UMBR														18.1	
LUZU MULT														11.1	
LUZU PILO											14.1			14.1	
MELA SYLV														4.1	
PELL SP.										2.1		17.1		29.1	
PLAG ELLI														7.1	

continue

***Table 19** continue*

Type	1 Rc	2 CPp	3 SRS	4 AS	5 PE	6 PB	7 DS	8 RS	9 SPR	10 SCn	11 SNs	12 SCr	13 SPt	14 ADc	15 AA
No of quad.	4	6	30	5	15	53	2	7	20	41	7	12	5	28	8
Analyser															
POHL SPP.						2.1								11.1	
PSEU CINC														4.1	
RHIZ MAGN														14.1	
RHIZ PUNC													20.1	11.1	
SCIL PALL														7.1	
SOLI VIRG														7.1	
SPHA TERE													20.1	7.1	
TARA SPP.														4.1	
VALE SAMB														7.1	
CALA PURP						2.1			15.1	5.1			40.1	43.9	8.1
RHYT SQUA										5.2		17.1		86.3	50.2
STEL CALY														29.1	
TRIE EURO										7.1	71.1			68.1	50.1
ATHY FILI														46.1	42.2
CERA FONT														11.1	
DRYO EXPA														36.1	42.1
POAP RATE														18.1	25.1
POTE PALU										2.1		8.1		21.1	
PRUN PADU														21.1	
RANU ACRI						2.1				7.1				50.2	42.1
RIBE UVAC														4.1	
THEL PHEG														11.1	17.1
BRAC STAR														7.1	33.1
GERA SYLV														4.1	8.2
RHOD ROSE														4.1	17.1
STEL NEMO										5.1				25.2	58.4
DRYO CART														4.1	25.1
POHL CRUD										2.1				4.1	25.1
ALCH VULG														14.1	58.1
ATHY DIST														14.1	58.3
GYMN DRYO															25.1
OXAL ACET														4.1	50.1
RANU REPE														7.1	67.1
MARC ALPE						9.1				2.1				21.1	8.1
RUME ACET						15.1								36.1	42.1

Table 20 *Number of species in the 5 constancy classes in the different vegetation types. - Antall arter i hver av de 5 konstansklassene i de utskilte vegetasjonstypene.*
n = Number of samples. - Antall ruteanalyser.

Type		n	V	IV	III	II	I
Rc	1	4	2		8	5	
CPp	2	6	12	4	9	10	11
SRS	3	30	4	7	2	16	51
AS	4	5	12	11	9	10	23
PE	5	15	3	1	4	5	11
PB	6	53	4	1	7	5	58
DS	7	2					
RS	8	7	5		4	4	8
SPR	9	20	8	2	4	14	26
SCn	10	41	7	4	4	8	52
SNs	11	7	17	8	4	12	10
SCr	12	12	5	3	2	11	25
SPt	13	5	7	5	5	8	18
ADc	14	28	4	8	10	22	68
AA	15	8	7	10	1	11	12

Table 21 *Uniformity indices of the different vegetation types. - Uniformitetsindekser for de utskilte vegetasjonstypene.*

Sn = Total number of species in the type. - Totalt artsantall i vegetasjonstypen.
S1 = Mean number of species in the type. - Midlere artsantall i vegetasjonstypen.
n = Number of quadrats in the type. - Antall analyseruter i vegetasjonstypen.
S1/& Uniformity index. - Uniformitetsindeks.

Type		Sn	S1	n	Sn/S1	S1/&
Rc	1	15	7.3	4	2.1	1.4
CPp	2	46	23.0	6	2.0	1.8
SRS	3	80	18.0	30	4.4	0.9
AS	4	65	34.8	5	1.9	2.0
PE	5	24	8.7	15	2.8	1.3
PB	6	75	13.2	53	5.7	0.7
DS	7	41	33.5	2		
RS	8	21	8.7	7	2.4	1.2
SPR	9	54	17.4	20	3.1	1.3
SCn	10	75	17.1	41	4.4	1.0
SNs	11	51	28.7	7	1.8	2.1
SCr	12	46	14.0	12	3.3	0.9
SPt	13	43	20.8	5	2.1	1.5
ADc	14	112	26.2	28	4.3	0.9
AA	15	41	18.8	8	2.2	1.6

6 Vegetation transects

In order to elucidate the zonation of the vegetation on the sandur, several transects from the river bank to the top of the sandur have been investigated in different parts of the area. These have been divided into zones in which the vegetation is quite homogenous, and within each zone cover degrees have been estimated, either by percentage or on the Hult-Sernender-DuRietz scale.

Transect 1 (Table 22) This is situated in the southernmost part of the sandur. It stretches 100 m in a westerly direction from the river. 9 different vegetation zones have been distinguished, and in each a 0.2 x 1.0 m quadrat has been analysed. Cover was estimated as percentages. The sediments are of silt and clay only. This transect is also described in Odland et al. (1989: 81-90).

The lower parts (zones 1 and 2) are influenced by frequent flooding with silt and clay deposition during summer. The vegetation cover is very sparse (10-20 %). Scattered plants of *Deschampsia cespitosa* and *Juncus alpinoarticulatus* are common. Zones 3 and 4 have a more continous vegetation cover, with *Pohlia filum* (mainly the gemmiferous or sterile forms) as dominant.

Zones 5-6 have a dense vegetation cover (70-90 %), mainly dominated by *Pohlia filum*. In these zones sporophyte-producing plants are found, and in zone 7 sporophyte plants are predominant. In addition *Blasia pusilla* and *Equisetum arvense* give a dense cover.

The highest zones 8 and 9 have a fairly stable vegetation. A low *Salix* shrub layer is dominated by *S. glauca*. In the field layer *Nardus stricta*, *Phleum alpinum*, and *Trifolium repens* are dominants, their density reducing the bottom layer. The transect is influenced by grazing and trampling from cows, which limits trees and shrubs, while favouring other species such as *Leontodon autumnalis* and *Trifolium repens*.

Transect 2 (Table 23) Transect 2 is found in the southern part of the sandur, some 500 m from the outlet. It stretches from a riverbank into an *Alnus* forest. The lowermost part of the transect lies only 10 cm above normal water-level. The sediments are silt and clay over the whole transect.

Six 1 x 0.5 m quadrats within homogenous zones were analyzed along the transect, and cover degree estimated in percentages.

The outermost part of the transect has recently been overlain by a ca. 10 cm layer of silt. In quadrat 1 scattered plants of *Eriophorum scheuchzeri*, *Deschampsia cespitosa*, *D. alpina*, *Carex nigra* and *Eriophorum angustifolium* have survived after this deposition. In quadrat 2 deposited silt covers approximately 75 % of the quadrat while quadrat 3 has only small patches of silt. The vegetation cover is dense, especially in the bottom layer. Sporophyte producing plants of *Philonotis tomentella* and *Pohlia filum* are common. Small bushes of willow and birch are established. Quadrats 4 and 5 have more willow bushes and a higher cover of *Racomitrium canescens*. In quadrat 5 there is a greater frequency of vascular plants. The transect ends within an *Alnus incana* forest stand (quadrat 6), with approximately 4 m high trees. The most common species are *Deschampsia cespitosa*, *Carex nigra*, and *Racomitrium canescens*.

Transect 3 (Table 24) Transect 3 is situated in the southern part of the sandur, some 600 m from the outlet. It stretches in a northwesterly direction from a riverbank into an *Alnus* forest stand, some 100 m from the river. This area was eroded some 7 years before the analysis. The sediments are variable, with both sand and silt. Nine quadrats (2 m x 2 m) have been analyzed along the transect, with cover given in percentages.

The lowest part of the transect is situated some 18 cm above water-level, while the highest part is 53 cm above.

In quadrats 1 and 2 the sediments are mainly coarse, with few vascular plants. *Blasia pusilla* and *Pohlia filum* are dominants. Quadrat 3 is situated in an old river channel with some fine sediments. *Racomitrium canescens*, *Stereocaulon* sp., and hepatics dominate the dense bottom layer.

Quadrat 4 is also situated in an old river channel. It has a dense moss layer of *Racomitrium canescens* coll. and hepatics, and scattered vascular plants. Quadrats 5-8 lie on a small ridge of mainly coarse material. The dense bottom layer is dominated by *Pohlia filum*, *Blasia pusilla*, *Racomitrium canescens* coll. or hepatics. Vascular plants have only a scattered distribution. Quadrat 9 is situated within a stable *Alnus incana* forest stand. This is an ADc forest type with a sparse moss layer of *Rhytidiadelphus squarrosus* and *Drepanocladus uncinatus*.

Transect 4 (Table 25) This transect is found some 1.5 km north of the outlet, in the western part of the sandur. It stretches from the main, central river in a northwesterly direction. 2 x 2 m quadrats have been analysed, and cover degree estimated according to the Hult-Sernander-DuRietz scale.

Table 22 *Transect 1. - Bandprofil 1.*

Quadrat no. - Anal nr.	1	2	3	4	5	6	7	8	9
Distance (dm) - Avstand	78	185	238	285	357	425	505	732	1000
Height willow (cm) - Høyde vier	-	-	-	-	-	-	-	30	30
H. a. water-level (cm) Høyde over vannivå	13	32	37	43	44	43	45	80	80
Salix nigricans	1	1	1	1	2	1	1	5	-
Deschampsia alpina	1	3	1	1	-	-	1	1	-
Alnus incaca	-	-	-	-	-	-	-	1	-
Deschampsia cespitosa	1	1	-	1	1	1	1	1	1
Eriophorum angustifolium	-	-	1	20	-	1	-	-	-
Phleum alpinum	1	-	1	-	1	1	-	10	5
Carex canescens	-	-	1	-	1	1	1	-	-
Agrostis mertensii	2	1	1	1	1	2	2	1	1
Juncus alpinoarticulatus	1	1	1	1	1	2	1	-	-
Philonotis tomentella	-	-	-	-	-	-	3	-	-
Pohlia flium (s)	-	-	-	-	10	10	40	1	-
Pohlia filum (tot)	2	8	30	50	40	50	30	1	-
Blasia pusilla	-	-	-	2	10	6	2	1	-
Carex nigra	1	1	-	1	2	3	+	5	1
Poa flexuosa	-	-	1	-	-	-	-	-	-
Racomitrium canescens	-	-	-	-	-	-	-	-	1
Equisetum arvense	1	-	1	1	7	2	5	-	-
Salix lapponum	-	-	-	-	-	-	-	5	1
Juncus filiformis	-	-	-	-	-	1	-	1	1
Eriophorum scheuchzeri	1	1	1	1	1	1	1	-	-
Luzula frigida	-	-	-	-	-	-	-	-	1
Nardia scalaris	-	-	-	-	-	-	2	1	-
Scapania sp.	-	-	-	-	-	-	-	1	-
Drepanocladus uncinatus	-	-	-	-	-	-	-	1	1
Calliergon stramineum	-	-	-	-	-	1	1	-	-
Potentilla erecta	-	-	-	-	-	-	-	1	1
Salix glauca	-	-	-	-	-	-	-	25	20
Salix glandulifera	-	-	-	1	-	-	-	1	-
Nardus stricta	-	-	-	-	-	-	-	30	30
Agrostis capillaris	-	-	-	-	-	-	-	10	1
Trifolium repens	-	-	-	-	-	-	-	1	15
Viola palustris	-	-	-	-	-	-	-	10	10
Salix herbacea	-	-	-	-	-	-	-	-	1
Trientalis europaea	-	-	-	-	-	-	-	-	1
Ranunculus acris	-	-	-	-	-	-	-	-	1
Polygonum viviparum	-	-	-	-	-	-	-	-	1
Carex echinata	-	-	-	-	-	-	-	-	1
Calluna vulgaris	-	-	-	-	-	-	-	-	1
Rhytidiadelphus squarrosus	-	-	-	-	-	-	-	-	1

The lower part of the transect is influenced by water-level fluctuations. Here vegetation is dominated by mosses (*Racomitrium canescens* coll. and *Pohlia flium*) with scattered vascular plants. Circa 30 m north of the river-bank *Alnus incana* becomes dominant and of the SCn type. Quadrat 9 is in an eroded river channel. Quadrats 12 and 13 have *Alnus incana-Deschampsia cespitosa-Ranunculus acris* vegetation influenced by grazing. The age of the trees is greater than 50 years.

Transects 5, 6 and 7 (Tables 26, 27 and 28) These transects are situated in the central part of the sandur. Vegetation zonation from the river, up a river bank to the top of the sandur is represented here, the difference in height being approximately 20 cm. The sediments are mainly coarse, but with some fine-graded, wet sediments in the lower part. Transects 6 and 7 run from one river bank to another, over a sediment ridge. The transects show fine scale variation due to height differences in relation to water level. Some species are closely related to the lower part of the transects, e.g. *Philonotis tomentella*, *Epilobium anagallidifolium*, *Saxifraga stellaris*, *Oxyria digyna*, *Equisetum arvense*, *Carex rufina*, and *Marchantia alpestris*, while others are mainly restricted to the highest part e.g. *Racomitrium canescens* coll., *Stereocaulon glaerosum*, *Polytrichum piliferum*, *Calluna vulgaris*, *Vaccinium myrtillus*, and *Empetrum hermaphroditum*.

Transect 8 (Table 29) Transect 8 runs across a bar between two river channels. The bar is situated at a low level, and therefore hygrophilous species grow over the whole transect. The sediments are silt and sand. In the lower lying parts (quadrats 1-6 and 14-16, within the river channels), the vegetation is dominated by *Pohlia filum*, and other species are sparse. The higher parts (quadrats 7-13) are also dominated by *Pohlia filum*, but with several vascular plants frequent, e.g. *Salix* spp., *Deschampsia alpina*, and *Carex nigra*.

The general zonation pattern is discussed in chapter 9.

Table 23 *Transect 2. - Bandprofil 2.*

Quadrat no. - Anal nr.	1	2	3	4	5	6
Distance (dm) - Avstand	6	26	67	161	340	381
Height of tree layer (m) - Høyde tresjikt	-	-	-	-	-	4
Height of willows (cm) - Høyde vier	-	-	-	20	30	40
H. a. water-level (cm) - Høyde over vann-nivå	10	10	13	13	23	31
Bare silt (%) - Naken silt	100	75	5	-	-	-
Eriophorum scheuchzeri	-	10	-	-	-	-
Juncus alpinoarcticulatus	-	3	-	-	-	-
Pohlia filum (tot)	-	2	10	1	1	1
Equisetum arvense	-	2	-	1	1	1
Blasia pusilla	-	1	5	1	1	1
Juncus filiformis	-	1	-	-	1	-
Eriophorum angustifolium	1	-	1	-	1	1
Carex nigra	-	1	-	10	10	5
Salix nigricans	-	1	3	3	25	20
Deschampsia cespitosa	-	2	1	-	5	10
Pohlia flium (s)	-	-	5	-	-	-
Betula pubescens juv.	-	-	1	-	1	1
Agrostis mertensii	-	-	2	2	2	1
Philonotis tomentella	-	-	20	3	5	-
Pinguicula vulgaris	-	-	1	1	1	-
Salix lapponum	-	-	2	2	5	-
Luzula frigida	-	-	1	-	-	-
Hepaticae spp.	-	-	20	10	1	10
Racomitrium canescens	-	-	2	20	50	10
Stereocaulon sp.	-	-	-	1	-	-
Calliergon stramineum	-	-	-	5	2	-
Drepanocladus uncinatus	-	-	-	5	1	1
Carex canescens	-	-	-	-	1	-
Epilobium anagallidifolium	-	-	-	-	-	1
Luzula sudetica	-	-	-	-	1	-
Pyrola minor	-	-	-	-	1	2
Phleum alpinum	-	-	-	-	1	1
Polytrichum commune	-	-	-	-	1	1
Potentilla erecta	-	-	-	-	1	1
Salix glauca	-	-	-	-	1	1
Vaccinium myrtillus	-	-	-	-	-	1
Melampyrum pratense	-	-	-	-	-	1
Potentilla palustre	-	-	-	-	-	1
Alnus incaca	-	-	-	-	-	70

Table 24 *Transect 3. - Bandprofil 3.*

Quadrat no. - Anal nr.	1	2	3	4	5	6	7	8	9
Distanse (dm) - Avstand	22	50	170	370	475	535	660	787	965
Height of tree layer (m) - Høyde tresjikt	-	-	-	1.5	-	1.5	-	0.5	5.0
Height of willow (cm) - Høyde vier	40	15	10	15	20	50	30	30	50
H. a. water-level (cm) - Høyde over vann-nivå	18	28	44	38	42	42	56	53	53
Salix nigricans	15	5	1	10	5	30	15	15	30
Alnus incaca	1	-	-	3	-	2	1	2	80
Deschampsia cespitosa	2	-	-	-	2	1	1	1	30
Eriophorum angustifolium	2	-	-	-	1	1	-	1	-
Phleum alpinum	1	1	-	1	1	-	1	1	-
Carex canescens	1	-	-	-	2	5	1	1	1
Agrostis mertensii	2	1	1	3	3	2	2	2	-
Oxyria digyna	1	-	-	-	-	-	-	-	-
Juncus alpinoarcticulatus	1	-	-	1	-	1	-	-	-
Philonotis tomentella	30	-	-	-	5	2	1	5	-
Pohlia flium (s)	-	-	-	-	-	-	-	40	-
Pohlia filum (tot)	50	80	-	-	30	40	10	70	-
Blasia pusilla	40	30	-	-	40	30	2	10	-
Racomitrium canescens	10	20	40	60	2	15	30	10	-
Equisetum arvense	-	1	-	-	1	2	1	-	2
Hepaticae spp.	-	10	20	30	1	5	50	10	2
Stereocaulon sp.	-	1	30	5	-	-	10	1	-
Polytrichum piliferum	-	-	1	2	-	-	2	1	-
Salix lapponum	-	-	-	1	-	-	1	-	5
Salix herbacea	-	-	-	1	-	-	-	-	-
Vaccinium uliginosum	-	-	-	1	-	-	-	-	-
Betula pubescens juv.	-	-	-	2	1	-	1	1	-
Calamagrostis purpurea	-	-	-	1	-	-	-	-	-
Empetrum hermaphroditum	-	-	-	1	-	-	-	-	-
Pogonatum urnigerum	-	-	-	1	-	-	3	1	-
Silene rupeatris	-	-	-	1	-	-	-	-	-
Deschampsia alpina	-	-	-	-	2	-	1	1	-
Agrostis canina	-	-	-	-	1	-	-	-	-
Juncus filiformis	-	-	-	-	1	1	-	-	1
Carex rufina	-	-	-	-	1	2	-	-	-
Salix glandulifera	-	-	-	-	-	1	-	-	-
Eriophorum scheuchzeri	-	-	-	-	-	1	-	-	-
Sagina saginoides	-	-	-	-	-	-	1	-	-
Luzula frigida	-	-	-	-	-	-	-	1	-
Carex brunnescens	-	-	-	-	-	-	1	-	2

continue

***Table 24** continue*

Quadrat no. - Anal nr.	1	2	3	4	5	6	7	8	9
Distanse (dm) - Avstand	22	50	170	370	475	535	660	787	965
Height of tree layer (m) - Høyde tresjikt	-	-	-	1.5	-	1.5	-	0.5	5.0
Height of willow (cm) - Høyde vier	40	15	10	15	20	50	30	30	50
H. a. water-level (cm) - Høyde over vann-nivå	18	28	44	38	42	42	56	53	53
Stellaria calycantha	-	-	-	-	-	-	1	-	-
Cerastium cerastioides	-	-	-	-	-	-	1	-	-
Nardus stricta	-	-	-	-	-	-	1	-	-
Rumex acetosa	-	-	-	-	-	-	1	-	-
Luzula sudetica	-	-	-	-	-	-	1	-	1
Luzula spicata	-	-	-	-	-	-	-	1	-
Oligotrichum hercynicum	-	-	-	-	-	-	-	1	-
Corallorhiza trifida	-	-	-	-	-	-	-	-	1
Pyrola minor	-	-	-	-	-	-	-	-	1
Brachythecium salebrosum	-	-	-	-	-	-	-	-	2
Rhytidiadelphus squarrosus	-	-	-	-	-	-	-	-	10
Drepanocladus uncinatus	-	-	-	-	-	-	-	-	10
Pellia epiphylla	-	-	-	-	-	-	-	-	2
Polytrichum commune	-	-	-	-	-	-	-	-	2
Brachythecium strakei	-	-	-	-	-	-	-	-	2
Marchantia polymorpha	-	-	-	-	-	-	-	-	2
Pohlia cruda	-	-	-	-	-	-	-	-	2

Table 25 *Transect 4. - Bandprofil 4.*

Quadrat no. - Anal nr.	1	2	3	4	5	6	7	8	9	10	11	12	13
Distanse from river (dm) - Avstand fra elv	13	60	110	136	190	270	310	435	450	490	540	84	1050
Height of tree layer (cm) - Høyde tresjikt	-	30	30	250	350	400	500	500	700	500	600	800	1000
Height of willow (cm) - Høyde vier	15	50	150	200	200	200	200	200	50	200	50	50	50
Cover A layer (%) - Dekning A	-	5	5	5	5	10	20	30	20	30	5	20	20
Cover B layer (%) - Dekning B	20	10	30	40	40	45	50	10	10	10	5	10	5
Cover C layer (%) - Dekning C	5	5	10	15	20	30	30	30	10	20	20	20	20
Cover D layer (%) - Dekning D	30	30	50	60	70	70	80	80	10	80	30	80	60
Salix lapponum	2	2	2	2	2	3	2	1	1	1	1	2	1
Salix nigricans	2	1	2	3	2	2	2	1	1	1	1	2	1
Phleum alpinum	1	-	1	1	1	-	1	1	-	1	-	1	1
Carex nigra	1	1	1	1	1	2	2	1	-	2	-	2	2
Equisetum arvense	1	1	2	2	1	1	2	1	1	1	1	2	2
Eriophorum angustifolium	1	1	1	1	2	2	1	1	1	1	2	1	-
Pohlia filum	1	4	4	4	5	5	5	4	1	1	-	1	-
Racomitrium canescens	1	2	3	3	1	1	1	-	-	3	-	-	-
Scapania cf. curta	1	1	1	-	-	-	-	-	-	-	-	-	-
Alnus incana	-	1	2	2	2	4	4	5	2	3	1	3	4
Agrostis mertensii	-	1	1	1	-	-	-	-	-	-	-	-	-
Deschampsia alpina	-	1	-	-	-	-	-	-	-	-	-	-	-
Philonotis tomentella	-	1	-	-	1	-	1	-	1	-	-	-	-
Racomitrium canescens	-	1	1	-	-	-	-	-	-	-	-	-	-
Cephalozia sp.	-	1	-	-	-	-	-	-	-	-	-	-	-
Nardia geoscyphus	-	1	1	-	-	-	-	-	-	-	-	-	-
Ceratodon purpureus	-	1	1	-	-	-	-	-	-	-	-	-	-
Epilobium anagallidifol.	-	-	1	-	-	-	-	-	-	-	-	-	-
Stereocaulon sp.	-	-	1	-	-	-	-	-	-	-	-	-	-
Marchantia alpestris	-	-	1	-	-	-	-	-	-	-	-	-	-
Polytrichum piliferum	-	-	1	-	-	-	-	-	-	-	-	-	-
Solenostoma sphaerocarpa	-	-	1	-	-	-	-	-	-	-	-	-	-
Anthelia juratzkana	-	-	1	-	-	-	-	-	-	-	-	-	-
Kiaeria glacialis	-	-	1	-	1	-	-	-	-	-	-	-	-
Bryum sp.	-	-	1	1	1	1	-	-	-	-	-	-	-
Blasia pusilla	-	-	2	2	3	4	4	4	1	2	-	2	1
Deschampsia cespitosa	-	-	-	1	1	1	1	2	-	1	-	2	-
Juncus filiformis	-	-	-	1	-	1	1	1	-	1	-	2	1
Carex rostrata	-	-	-	1	3	2	1	1	2	1	3	-	-

continue

Table 25 continue

Quadrat no. - Anal nr.	1	2	3	4	5	6	7	8	9	10	11	12	13
Distanse from river (dm) - Avstand fra elv	13	60	110	136	190	270	310	435	450	490	540	84	1050
Height of tree layer (cm) - Høyde tresjikt	-	30	30	250	350	400	500	500	700	500	600	800	1000
Height of willow (cm) - Høyde vier	15	50	150	200	200	200	200	200	50	200	50	50	50
Cover A layer (%) - Dekning A	-	5	5	5	5	10	20	30	20	30	5	20	20
Cover B layer (%) - Dekning B	20	10	30	40	40	45	50	10	10	10	5	10	5
Cover C layer (%) - Dekning C	5	5	10	15	20	30	30	30	10	20	20	20	20
Cover D layer (%) - Dekning D	30	30	50	60	70	70	80	80	10	80	30	80	60
Eriophorum scheuchzeri	-	-	-	-	1	-	-	-	-	-	-	-	-
Pinguicula vulgaris	-	-	-	-	1	-	-	-	-	-	-	-	-
Pohlia cruda	-	-	-	-	1	-	-	-	-	-	-	-	-
Pohlia wahlenbergii	-	-	-	-	1	-	1	-	-	-	-	-	-
Cephalozia bicuspidata	-	-	-	-	1	1	-	-	-	-	-	-	-
Scapania sp.	-	-	-	-	1	-	1	-	-	-	-	1	-
Ditrichum pusillum	-	-	-	-	1	1	-	1	1	-	-	-	-
Carex canescens	-	-	-	-	1	1	1	2	-	1	1	2	1
Veronica serpyllifolia	-	-	-	-	-	1	-	-	-	-	-	-	-
Scapania cf. obcordata	-	-	-	-	-	1	-	-	-	-	-	-	-
Pohlia cf. bulbifera	-	-	-	-	-	1	-	-	-	-	-	-	-
Pohlia drummondii	-	-	-	-	-	1	-	-	-	-	-	1	-
Bryum sp.	-	-	-	-	-	1	-	-	-	-	-	1	-
Drepanocladus uncinatus	-	-	-	-	-	-	1	-	1	1	-	-	1
Betula pubescens	-	-	-	-	-	-	1	-	1	1	-	-	-
Poa annua	-	-	-	-	-	-	1	2	-	1	-	-	1
Polytrichum commune	-	-	-	-	-	-	1	2	-	4	-	1	1
Rhytidiadelphus squarr.	-	-	-	-	-	-	1	3	-	3	-	5	5
Betula pubescens	-	-	-	-	-	-	-	1	2	1	-	1	-
Salix glandulifera	-	-	-	-	-	-	-	1	-	-	-	-	-
Ranunculus acris	-	-	-	-	-	-	-	1	-	-	-	2	3
Pyrola minor	-	-	-	-	-	-	-	1	-	-	-	1	1
Trientalis europaea	-	-	-	-	-	-	-	1	-	-	-	1	1
Sphagnum girgensohnii	-	-	-	-	-	-	-	1	-	1	-	-	-
Sphagnum squarrosus	-	-	-	-	-	-	-	1	-	-	4	-	-
Calliergon stramineum	-	-	-	-	-	-	-	1	-	1	1	1	-
Calliergon cordifolium	-	-	-	-	-	-	-	-	1	-	-	-	-
Pellia neesiana	-	-	-	-	-	-	-	-	1	-	-	-	-
Brachythecium mildeanum	-	-	-	-	-	-	-	-	1	-	-	-	-

continue

Table 25 *continue*

Quadrat no. - Anal nr.	1	2	3	4	5	6	7	8	9	10	11	12	13
Distanse from river (dm) - Avstand fra elv	13	60	110	136	190	270	310	435	450	490	540	84	1050
Height of tree layer (cm) - Høyde tresjikt	-	30	30	250	350	400	500	500	700	500	600	800	1000
Height of willow (cm) - Høyde vier	15	50	150	200	200	200	200	200	50	200	50	50	50
Cover A layer (%) - Dekning A	-	5	5	5	5	10	20	30	20	30	5	20	20
Cover B layer (%) - Dekning B	20	10	30	40	40	45	50	10	10	10	5	10	5
Cover C layer (%) - Dekning C	5	5	10	15	20	30	30	30	10	20	20	20	20
Cover D layer (%) - Dekning D	30	30	50	60	70	70	80	80	10	80	30	80	60
Scapania hyperborea	-	-	-	-	-	-	-	-	1	-	-	-	-
Lophozia sp.	-	-	-	-	-	-	-	-	1	-	-	-	-
Splachnum sphaericum	-	-	-	-	-	-	-	-	-	1	-	-	-
Potentilla palustre	-	-	-	-	-	-	-	-	-	1	1	1	1
Philonotis seriata	-	-	-	-	-	-	-	-	-	-	-	1	-
Stellaria calycantha	-	-	-	-	-	-	-	-	-	-	-	1	-
Angelica sylvestris	-	-	-	-	-	-	-	-	-	-	-	1	-
Vaccinium uliginosum	-	-	-	-	-	-	-	-	-	-	-	1	-
Vaccinium myrtillus	-	-	-	-	-	-	-	-	-	-	-	1	1
Dryopteris expansa	-	-	-	-	-	-	-	-	-	-	-	1	1
Luzula sudetica	-	-	-	-	-	-	-	-	-	-	-	1	1
Polygonum viviparum	-	-	-	-	-	-	-	-	-	-	-	1	1
Viola palustris	-	-	-	-	-	-	-	-	-	-	-	1	1
Athyrium filix-femina	-	-	-	-	-	-	-	-	-	-	-	1	1
Prunus padus	-	-	-	-	-	-	-	-	-	-	-	1	1
Athyrium distentifolium	-	-	-	-	-	-	-	-	-	-	-	-	1
Cerastium fontanum	-	-	-	-	-	-	-	-	-	-	-	-	1
Thelypteris phegopteris	-	-	-	-	-	-	-	-	-	-	-	-	1
Montia fontana	-	-	-	-	-	-	-	-	-	-	-	-	1
Poa pratensis	-	-	-	-	-	-	-	-	-	-	-	-	1
Ribes uva-crispa	-	-	-	-	-	-	-	-	-	-	-	-	1
Rumex acetosa	-	-	-	-	-	-	-	-	-	-	-	-	1
Sorbus aucuparia juv.	-	-	-	-	-	-	-	-	-	-	-	-	1

Table 26 *Transect 5. - Bandprofil 5.*

Quadrat no. - Anal nr.	1	2	3	4	5	6	7	8
Distanse (dm) - Avstand	10	20	27	40	97	127	185	190
Cover B layer (%) - Dekning B	1	-	5	10	5	10	5	1
Cover C layer (%) - Dekning C	5	5	5	5	5	5	5	1
Cover D layer (%) - Dekning D	50	30	80	90	90	90	80	70
Epilobium anagallidifolium	1	1	1	-	-	-	-	-
Saxifraga stellaris	1	1	1	-	-	-	1	-
Carex rufina	1	-	-	-	-	1	-	-
Cerastium cerastioides	1	1	1	-	1	1	-	-
Poa annua	1	-	1	-	1	1	-	-
Pohlia filum	5	2	4	5	5	5	5	1
Salix nigricans	1	-	2	2	2	2	2	1
Agrostis mertensii	1	1	1	1	1	1	1	1
Racomitrium canescens	1	-	3	1	1	1	3	5
Marchantia alpestris	-	-	1	-	-	1	-	-
Philonotis tomentella	-	-	2	-	-	-	2	-
Blasia pusilla	-	-	1	2	3	3	2	-
Phleum alpinum	-	-	1	1	1	1	1	-
Deschampsia alpina	-	-	1	1	1	1	1	-
Polytrichum juniperinum	-	-	1	-	1	1	1	-
Polytrichum piliferum	-	-	1	-	1	1	1	1
Hepaticae spp.	-	-	1	1	1	1	1	1
Eriophorum angustifolium	-	-	-	1	-	-	-	-
Salix glandulifera	-	-	-	1	-	-	1	-
Poa alpina	-	-	-	-	1	-	-	-
Juncus filiformis	-	-	-	-	1	-	-	-
Deschampsia cespitosa	-	-	-	-	1	-	1	-
Polytrichum sexangulare	-	-	-	-	1	1	1	-
Salix lapponum	-	-	-	-	1	1	1	1
Luzula spicata	-	-	-	-	1	1	1	1
Lotus corniculatus	-	-	-	-	-	1	-	-
Rumex acetosa	-	-	-	-	-	1	-	-
Equisetum arvense	-	-	-	-	-	1	1	-
Carex canescens	-	-	-	-	-	-	1	-
Oxyria digyna	-	-	-	-	-	-	1	1
Carex sp.	-	-	-	-	-	-	-	1
Stereocaulon sp.	-	-	-	-	-	-	-	2

Table 27 *Transect 6. - Bandprofil 6.*

Quadrat no. - Anal nr.	1	2	3	4	5	6	7	8
Distanse from river (dm) - Avstand fra elv	5	10	39	42	65	77	81	91
Cover B layer (%) - Dekning B	5	10	5	20	5	5	5	20
Cover C layer (%) - Dekning C	15	15	5	5	5	5	15	1
Cover D layer (%) - Dekning D	70	90	90	60	80	90	90	30
Poa flexuosa	1	-	-	1	-	-	-	-
Calliergon sarmentosum	1	-	-	-	-	-	-	-
Philonotis tomentella	2	-	-	-	-	-	-	-
Epilobium anagallidifolium	1	1	-	-	-	-	1	-
Phleum alpinum	1	1	1	-	-	-	1	-
Saxifraga stellaris	1	1	1	-	-	-	1	-
Oxyria digyna	2	2	2	1	-	-	1	-
Hepaticae spp.	1	1	1	1	4	3	1	-
Luzula spicata	1	1	1	1	1	1	1	-
Cerastium cerastioides	1	1	1	1	1	1	1	-
Blasia pusilla	2	2	1	1	1	2	1	-
Racomitrium canescens	2	2	2	3	4	4	1	-
Deschampsia alpina	1	1	1	1	-	1	1	1
Agrostis mertensii	1	1	1	1	1	1	1	1
Pohlia filum	5	5	5	4	1	4	4	1
Salix lapponum	1	1	1	1	1	1	1	1
Salix nigricans	1	1	1	1	1	1	1	2
Salix glandulifera	-	1	-	1	-	1	1	1
Poa glauca	-	-	1	-	-	-	-	-
Lotus corniculatus	-	-	1	-	-	-	-	-
Deschampsia flexuosa	-	1	-	-	1	-	-	-
Rumex acetosa	-	-	-	1	-	-	-	-
Sagina saginoides	-	-	-	1	-	-	-	-
Polytrichum juniperinum	-	-	-	1	1	1	-	-
Polytrichum piliferum	-	-	-	1	1	1	-	-
Vaccinium myrtillus	-	-	-	1	1	1	-	-
Calluna vulgaris	-	-	-	-	1	-	-	-
Stereocaulon sp.	-	-	-	-	1	1	-	-
Polytrichum sexangulare	-	-	-	-	1	1	-	-
Deschampsia cespitosa	-	-	-	-	-	1	-	-
Empetrum hermaphroditum	-	-	-	-	-	1	-	-
Calamagrostis purpurea	-	-	-	-	-	1	-	-
Equisetum arvense	-	-	-	-	-	-	-	1

Table 28 *Transect 7. - Bandprofil 7.*

Quadrat no. - Anal nr.	1	2	3	4	5	6
Distanse from river (dm) - Avstand fra elv	13	17	21	51	58	75
Height of willow (cm) - Høyde vier	20	15	15	80	40	30
Cover B layer (%) - Dekning B	5	20	10	1	10	20
Cover C layer (%) - Dekning C	5	5	5	5	5	5
Cover D layer (%) - Dekning D	90	90	90	70	90	80
Pohlia filum	5	5	5	1	4	4
Racomitrium canescens	1	1	2	4	3	1
Blasia pusilla	2	3	2	1	1	1
Hepaticae spp.	3	2	1	3	4	1
Salix nigricans	1	2	2	1	2	2
Agrostis mertensii	1	1	1	1	1	1
Salix lapponum	1	1	1	-	1	1
Phleum alpinum	1	1	-	-	1	1
Cerastium cerastoides	1	1	-	-	1	1
Epilobium anagallidifolium	1	1	-	-	-	-
Deschampsia alpina	1	-	-	-	-	1
Luzula spicata	1	-	-	-	-	1
Marchantia alpestris	1	-	-	-	-	-
Bryum sp.	1	-	-	-	-	-
Philonotis tomentella	-	1	1	-	2	4
Aulacomnium palustre	-	1	-	-	-	-
Salix glandulifera	-	1	1	-	-	-
Stereocaulon glaerosum	-	1	1	5	1	-
Oxyria digyna	-	1	1	-	1	1
Poa alpina	-	-	1	-	-	-
Betula pubescens juv.	-	-	1	1	-	-
Solorina crosea	-	-	-	1	-	-
Deschampsia cespitosa	-	-	-	-	1	-
Poa flexuosa	-	-	-	-	1	1
Festuca vivipara	-	-	-	-	1	1
Saxifraga stellaris	-	-	-	-	-	1

Table 29 *Transect 8. - Bandprofil 8.*

Quadrat no. - Anal nr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Distanse from river (dm) - Avstand fra elv	11	30	57	95	106	117	121	179	215	220	238	259	347	366	377	390
Height of willow (cm) - Høyde vier	5	5	5	5	5	-	-	30	5	20	20	20	30	10	5	2
Cover C layer (%) - Dekning C	1	1	1	1	1	-	30	5	1	15	10	5	10	5	1	1
Cover D layer (%) - Dekning D	60	50	70	20	80	90	60	60	90	80	90	90	90	90	80	50
Pohlia filum (tot.)	5	4	5	3	5	5	4	5	5	5	5	5	5	5	5	5
Racomitruim canescens coll.	1	1	1	-	1	2	1	1	2	1	3	1	1	1	1	1
Agrostis mertensii	1	1	1	1	1	-	2	1	1	1	2	3	1	1	1	1
Salix nigricans	1	1	1	-	-	-	2	1	1	2	2	1	2	1	1	1
Poa alpina	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Luzula spicata	1	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-
Stereocaulon sp.	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Saxifraga stellaris	1	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-
Stereocaulon cf. grande	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Betula pubescens juv.	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Stereocaulon cf. glaerosum	-	3	1	1	1	-	2	1	3	1	-	-	-	-	-	-
Blasia pusilla	-	1	2	-	1	1	2	3	3	3	3	4	2	4	4	-
Cerastium cerastoides	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Salix glandulifera	-	-	1	1	1	-	-	-	1	1	1	-	-	1	-	-
Phleum alpinum	-	-	1	-	-	-	1	-	1	-	-	2	1	-	1	-
Luzula sudetica	-	-	-	-	1	-	-	-	-	-	-	1	1	-	-	-
Carex rufina	-	-	-	-	1	-	-	1	1	-	1	1	1	-	-	-
Philonotis tomentella	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Deschampsia cespitosa	-	-	-	-	1	-	1	1	1	1	1	1	1	-	-	-
Deschampsia alpina	-	-	-	-	-	1	-	1	1	1	1	1	1	-	-	-
Equisetum arvense	-	-	-	-	-	1	1	1	1	1	-	1	1	-	-	-
Salix glandulifera	-	-	-	-	-	-	3	1	-	-	1	-	1	-	-	-
Salix lapponum	-	-	-	-	-	-	2	1	-	1	1	1	1	1	-	-
Eriophorum angustifolium	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-
Juncus filiformis	-	-	-	-	-	-	-	1	1	1	1	-	-	-	-	-
Carex nigra	-	-	-	-	-	-	-	1	-	1	1	1	1	-	-	-
Carex canescens	-	-	-	-	-	-	-	1	-	-	1	1	1	-	-	-
Rumex acetosa	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-
Oxyria digyna	-	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-
Ranunculus acris	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Leontodon autumnalis	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Salix herbacea	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Epilobium anagallidifolium	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Polytrichum spp.	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-
Lotus corniculatus	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

7 The vegetation in relation to environmental variables

The program CANOCO (ter Braak 1986) was used to undertake detrended correspondence analysis and canonical correspondence analysis on the data to detect major vegetation patterns on the sandur. Running the CCA program, the following 7 simple environmental factors were estimated for each quadrat:

height : height of the highest vegetation layer in the quadrats
tA+B : cover of tree and shrub layer (in percentages)
tC : cover of field layer
tD : cover of bottom layer
silt, sand, coarse : the particle size in the upper sediments have been estimated on a presence-absence scale of mainly silt (particles < 125 μm), mainly sand (particles 125 μm-12 mm), and mainly coarse material (particles > 16 mm).

The eigenvalues of the different axes of the DCA and CCA ordinations are shown below:

	CCA	DCA
Axis 1	0.537	0.625
Axis 2	0.233	0.531
Axis 3	0.206	0.316
Axis 4	0.116	0.270

Both the DCA and the CCA ordinations indicate that there are two main gradients in the data. Not surprisingly, the eigenvalues are higher in the DCA ordination than in the CCA ordination. The differences are, however, quite small even though the environmental variables used in the CCA ordination are simple, and certainly does not include the most important factors influencing the sandur vegetation i.e. relation to water-level.

The first 4 axes of the species-environment biplot account for the following percentages of variation: axis 1 - 58.8 %, axis 2 - 40.9 %, axis 3 -25.0 %, axis 4 - 16.0 %.

Axis 1 is highly correlated with height (r = 0.88), tC (r = 0.81) and silt (r = 0.67), while axis 2 is best correlated with coarse (r = 0.65).

In **Figure 12** the positions of the quadrats in relation to the two first axes in the CCA ordination are shown. The environmental factors are indicated by biplot arrows. Quadrats belonging to the different TWINSPAN groups are indicated. In general, there is a good conformity between the TWINSPAN grouping and the position of the quadrats in relation to the two first axes in the CCA ordination. AA, CPp and AS are positioned furthest distances from the origin, and in different parts of the diagram.

Below, a more detailed discussion of the relation between vegetation and the most important environmental factors on the sandur is given.

7.1 Sediments and vegetation

The sediments on the sandur have been eroded by the Steghol and Lodal glaciers, and deposited as outwash by the rivers coming from these glaciers. The size of the sediment particles is very variable, with extremely coarse material mainly found in the northern, proximal parts. Here the boulders are usually greater than 20 cm diameter. In the southern, distal part, mainly fine-graded sediments (silt and clay) predominate with more than 90 % of the particles on the surface being below 125 um. However, coarse sediments on freshly deposited surfaces can also be found in the distal areas due to continous sedimentation and erosion.

If the sediments are not too coarse, exposed areas will rapidly be overgrown by mosses. Moss tufts or compact moss carpets act as sedimentary traps, and during flooding fine sediments may be deposited. Different sediment composition is therefore often found with increasing depth.

On sites situated at heights where they are not inundated by normal floods, organic matter will in time develop a humus layer. This is a slow process, and no humus layer thicker than 2 cm has been found on the sandur surface today. Within sediment profiles organic layers are often found at different depths. These indicate periods with stable conditions when a humus layer has been developed. During extreme floods, thick layers of silt are deposited on the vegetation which must then be re-established.

Table 29 shows the particle size composition in 4 sediment profiles. These are all sites with fine-graded sediments on the surface. In the *Alnus incana* forest types there is a gradual decrease downwards of particles with diameter > 125 μm, which account for more than 90 % at the surface. However, even at 30 cm below the surface, the majority of the grains are > 125 um.

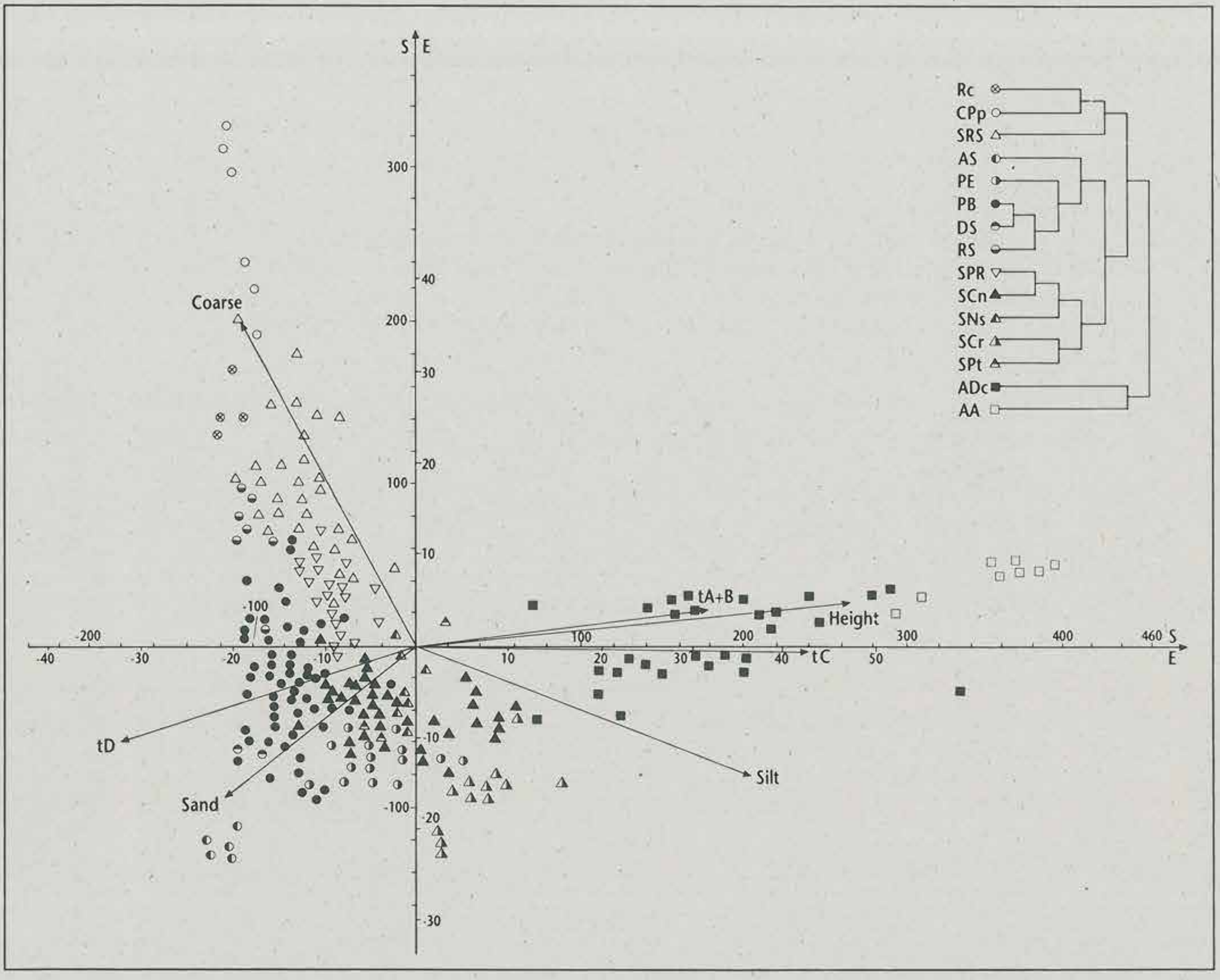


Figure 12 CCA ordination diagram showing the position of quadrats belonging to the different TWINSPAN quadrat groups and environmental variables in relation to CCA-axes 1 and 2. - Ordinasjon (CCA akse 1 og 2) av analyserutene tilhørende de 15 utskilte vegetasjonstypene og økologiske faktorer.

In **Table 30** the soil chemistry of 9 sediment profiles is presented. The data indicate a decrease in loss-on-ignition, cations, base saturation, and cation exchange capacity with increasing depth. pH, on the other hand, generally increases with increasing depth. The surface organic layers, where present, are characterised by high values for base saturation. This is mainly due to the very low hydrogen ion content of the soil.

Figure 13 shows a 45 cm deep sediment profile from the southern part of the sandur. It is covered by a dense grey alder vegetation dominated by grasses (type ADc). The whole profile has fine-graded sediments, but with decreasing percentages downwards of particles less than 125 um. The profile is also characterised by gley spots, indicating a fluctuating water level. Within the upper 32 cm there are several organic layers indicating 10 periods in the past with fairly stable conditions when a thin humus layer was developed. These periods have been followed by floods when 3-5 cm silt and clay were deposited. At the top, a mixture of organic material and silt 4 cm thick is indicative of the absence of heavy sedimentation over a long period, with only light deposition on the vegetation.

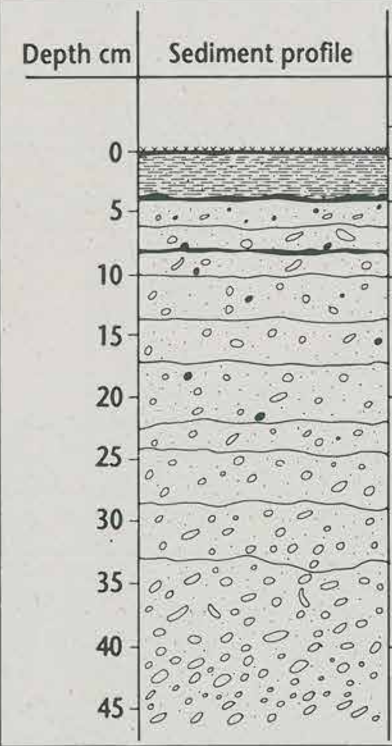
Table 30 *Variation in soil chemistry within sediment profiles. - Variasjon i jordkjemiske forhold i sedimentprofiler i ulike vegetasjonstyper.*
Niv = Depth of sample. - Dybde av prøven i cm.
Colour = Colour according to Muncell colour card. - Farge i henhold til munsells fargekart.
Den = Density (g/cm3). - Tetthet av prøven (g/cm3).
Ign = Loss-on-ognition (%). - Glødetap (%).
Cond = Conductivity (uS). - Ledningsevne (uS).
Na, K, Ca, Mg, H = Cations (mg/100 g dry soil). - Mengde av kationer i mg/100 g tørr jord.
CEC = Cation exchange capasity (me/100 g dry soil). - Utbyttingskapasitet (me/100 g tørr jord).
Base = Base saturation (%). - Basemetningsgrad (%).
Grain < 125 µm = Amoumt of particles < 125 µm (%). - Mengden av sedimentpartikler < 125 µm.

Type	Niv.	Colour	Den	Ign	pH	Cond	Na	K	Ca	Mg	H	CEC	Base	Grain < 125
AA	0-10	5Y4/2 olive grey	1.12	2.7	5.3	5.0	0.7	8.6	31.4	3.6	2.7	4.8	44	-
	10-20	10YR3/3 dark brown	1.03	3.7	4.9	6.9	0.8	6.5	23.4	2.8	5.2	6.8	24	86
	20-30	5Y5/3 olive	1.43	0.5	5.1	1.1	0.3	2.5	4.2	0.3	0.8	1.1	29	66
AA	1-10	10YR4/3 brown	1.04	3.0	4.7	31.0	0.3	5.1	22.4	4.4	3.0	4.6	35	95
	10-20	2.5Y4/2 olive grey	1.34	1.5	4.6	3.4	0.8	4.5	11.7	1.4	3.4	5.0	32	85
	20-40	2.5Y4/4 olive brown	1.37	1.4	4.7	4.5	0.7	4.0	6.5	0.3	2.1	2.6	18	78
AA	0-1		-	10.0	4.7	378.0	2.2	27.4	185.9	36.2	0.0	13.1	100	-
	1-5	10YR3/3 dark brown	0.97	5.3	4.7	7.5	1.0	16.7	5.1	10.9	5.0	8.9	44	-
	5-10	10YR4/3 brown	1.04	3.6	4.5	6.7	0.7	4.7	15.3	3.0	4.0	5.1	23	99
	10-20	2.5Y5/2 grey brown	1.38	1.7	4.9	4.3	0.5	3.4	7.2	0.6	2.5	3.0	17	89
	20-40	5Y5/3 olive	1.39	1.0	5.0	0.5	0.4	3.4	5.5	0.2	1.6	2.0	20	84
ADc	0-2	7.5YR dark brown	-	11.0	5.1	32.4	1.0	16.5	59.8	9.1	7.8	12.0	35	-
	2-7	2.5Y4/2 grey brown	-	0.7	5.1	5.9	0.6	6.1	6.0	0.5	1.6	2.1	25	-
SNs	0-0.2	2.5Y4/2 d.grey brown	-	5.8	5.2	16.9	1.2	24.5	39.9	8.3	3.5	6.9	49	-
	0.2-3	2.5Y4/2 d.grey brown	-	2.6	5.1	11.4	1.2	10.8	24.0	3.5	2.6	4.4	41	99
	3-7	10YR3/2 vd.grey b.	-	13.0	5.2	16.9	3.1	23.3	50.2	10.3	8.6	12.7	32	-
	7-15	5Y6/2 pale olive	1.40	1.4	5.4	14.7	1.0	6.0	16.0	2.6	2.2	3.4	35	96
	15-18	10YR5/6 yellow brown	-	0.6	5.4	4.1	0.5	3.4	5.1	0.3	0.8	1.2	33	74
	18-30	5Y5/2 olive	1.45	0.1	5.7	11.3	0.3	1.5	2.8	0.2	0.3	0.5	41	9
SCr	0-2	2.5Y4/2 d. grey b.	-	2.6	5.2	9.9	1.4	27.7	21.6	3.3	2.7	4.8	44	-
	3-17	5Y4/2 olive grey	-	0.4	5.6	5.2	0.5	4.2	4.9	0.4	0.7	1.1	37	-
	17-19	2.5Y d. grey brown	-	5.9	5.1	9.4	1.2	8.5	12.7	1.5	4.1	5.1	20	-
	70-73	5YR2.5/2 d.red brown	-	25.0	5.2	0.1	1.6	7.5	30.0	2.5	15.3	17.3	11	-
	73-97	7.5YR4/2 d. brown	-	14.0	5.1	0.8	1.3	4.0	12.0	1.1	8.8	9.6	9	-

continue

Table 30 continue

Type	Niv.	Colour	Den	Ign	pH	Cond	Na	K	Ca	Mg	H	CEC	Base	Grain < 125
SCn	0.5-5	2.5Y4/2 d. grey b.	-	2.7	6.5	410.0	1.3	152.2	32.2	6.5	0.0	6.1	100	-
	3-5	5Y4/2 olive grey	-	1.1	7.2	400.0	0.7	111.5	23.6	1.9	0.9	5.1	82	-
	6-7	2.5Y4/2d.grey brown	-	1.6	6.2	120.0	0.8	38.0	20.7	1.4	0.9	3.1	71	-
	7-18	5Y5/3 olive	-	0.3	5.7	15.3	0.3	3.2	8.2	0.4	0.5	1.0	52	-
	18-24	5Y4/2 olive grey	-	0.5	5.5	9.0	0.6	3.9	9.9	0.6	1.1	1.8	38	-
	24-25	10YR3/2 v.d. grey b.	-	4.5	5.0	19.7	1.2	12.9	23.8	2.1	3.7	5.4	32	-
	40-42	10YR3/2 v.d.grey b.	-	7.2	5.2	10.9	1.2	8.4	30.4	2.4	6.3	8.3	24	-
	54-56	7.5YR3/2 d. brown	-	8.0	4.4	52.1	1.0	6.1	33.8	2.8	6.4	8.5	25	-
SCn	0-2	10YR v.d.grey brown	-	7.0	5.0	36.7	1.9	28.2	99.9	7.7	4.6	11.0	58	-
	7-9	10YR3/3 dark brown	-	5.4	4.9	33.9	1.7	14.4	36.7	5.9	4.2	7.0	40	-
	10-17	5Y5/2 olive grey	1.53	0.6	5.4	12.7	0.5	2.7	6.4	0.5	0.7	1.2	39	54
PB	0-5	5Y5/2 olive grey	-	0.7	5.3	5.7	0.3	4.0	11.4	0.8	1.2	2.0	38	73
	5-15	5Y5/2 olive grey	-	0.8	5.8	17.5	0.6	4.9	4.5	0.6	0.5	0.9	46	-

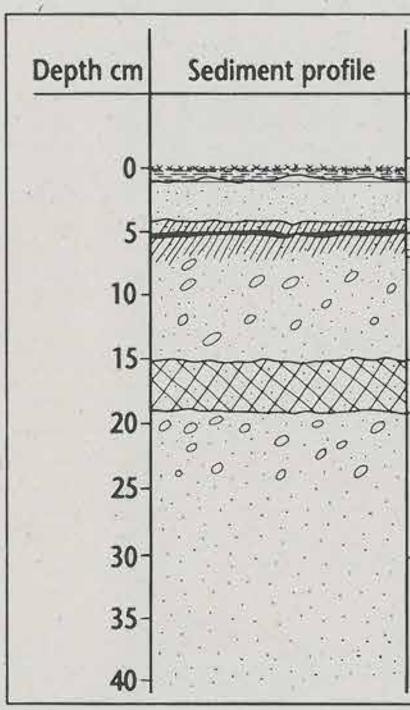


Soil chemistry: I	pH	uS	Na	K	Ca	Mg	H	CEC	B	Particle size %: >19	16	8	4	2	1	500	250	125	<125	Munsell soil colour
16.0	4.7	378.0	22	27.4	185.9	36.2	-	13.1	100											
5.3	4.7	7.5	1.0	16.7	5.1	10.9	5.0	8.9	44											10 YR 3/3
3.6	4.5	6.7	0.7	4.7	153	3.0	4.0	5.1	23						0.1	0.1	1	1	99	10 YR 4/3
1.7	4.9	4.3	0.5	3.4	7.2	0.6	2.5	3.0	17					0.1		1	3	7	89	2.5 Y 5/2
1.0	5.0	0.5	0.4	3.4	5.5	0.2	1.6	2.0	20							1	1	16	84	5 Y 5/3

Figure 13 *Sediment profile from an* Alnus incana-Deschampsia cespitosa *(ADc) vegetation type in the southern part of the sandur. Soil chemistry and sediment particle composition in the different layers are indicated. - Sedimentprofil i en* Alnus incana-Deschampsia *(ADc) bestand i de sørlige delene av sanduren. Jordkjemiske data og partikkelsammensetningen i ulike nivåer er angitt. Dark stripes (mørke bånd) - organic layer (organiske lag) Open sircles (åpne sirkler) - gley spots (gley flekker) Bold sircles (mørke sirkler) - tree roots (trerøtter).*

Figure 14 is a profile from the middle-eastern part of the sandur. The area has a *Salix-Nardus stricta* vegetation (quadrat 48, type SCn) which is situated some 40 cm above the normal water level. Fine particles characterise the top sediments, but below 18 cm depth there is a 30 cm layer of mainly sand (particles > 0.5 mm). Gley spots and reddish iron depositions indicate fluctuations in ground-water level. Within the upper part there are several thin organic layers. On the top there is a 1 cm thick layer of decayed moss above a 2 mm thick humus layer. Between 3 and 7 cm below the surface there are two humus layers separated by a humus-rich silt layer, indicating a long period with fairly stable vegetation conditions.

Figure 15 is a profile from the same area as **Figure 14**, but close to the western edge of the sandur. Here 97 cm of sediments have been deposited upon solid rock. The vegetation is dominated by *Carex rostrata*, *Calliergon stramineum*, *Drepanocladus uncinatus* and *Pohlia filum* (quadrat 83, type SCr). At the base the silt has a high organic matter content. At 70 cm depth a 3 cm thick organic layer indicates a long period with stable vegetation conditions. The silt/organic layer below is probably formed from old roots of the vegetation growing on this old surface. Above the organic layer then are alternating layers of pure silt and organic matter, indicative of periods with shorter or longer stable vegetation conditions.



Soil chemistry										Particle size %										Munsell soil colour
I	pH	uS	Na	K	Ca	Mg	H	CEC	B	>19	16	8	4	2	1	500	250	125	<125	
5.8	5.2	16.9	1.2	24.5	39.9	8.3	3.5	6.9	49											2.5 Y 4/2
2.6	5.1	11.4	1.2	10.8	24.0	3.5	2.6	4.4	41						0.1	0.1	0.1	0.1	99	2.5 Y 4/2
13.0	5.2	16.9	3.1	23.3	50.2	10.3	8.6	12.7	32											10 YR 3/2
1.4	5.4	14.7	1.0	6.0	16.0	2.6	2.2	3.4	35					1	1	1	1	3	96	5 Y 6/2
0.6	5.4	4.1	0.5	3.4	5.1	0.3	0.8	1.2	33				1	4	4	3	4	10	74	10 YR 5/6
0.1	5.7	11.3	0.3	1.5	2.8	0.2	0.3	0.5	41				3	13	28	26	11	10	9	5 Y 5/2

***Figure 14** Sediment profile from an* Salix-Nardus stricta *(SNs) vegetation type in the south-western part of the sandur. Soil chemistry and sediment particle composition in the different layers are indicated. Legends as in Figure 13. - Sedimentprofil i en* Salix-Nardus stricta *(SNs) bestand i de sørvestlige delene av sanduren. Jordkjemiske data og partikkelsammensetningen i ulike nivåer er angitt. Forklaring som i figur 13.*

Figures 13-15 give an impression of the very dynamic nature of the vegetation on the sandur. There have been periods when vegetation developed without disturbance for relatively long periods. One may assume that a 3 cm thick organic layer indicate several hundred years with stable vegetation conditions. Recent surface vegetation is at least 100 years old, and only a maximum 2.0 cm humus layer has been recorded. More detailed palynological investigations, macrofossil analyses, and radiocarbon datings of the organic layers may give valuable information on the history of the sandur and the activity of the Jostedalen glacier.

Particle size analysis has been undertaken from 46 of the quadrats (**Table 31**). Percentages in 10 groups have been calculated. **Table 31** indicates that the vegetation types may be separated into two main groups according to the sediment composition of the upper layer.

AA, ADc, SCr, SNs, SCn, and PE are mainly found on fine-graded sediments. SPR, PB, SRS and RS are found on sediments with a mixture of fine-graded and coarse material. Rc, AS, DS and PS also belong to this group, but there are no data available from these types.

The sediments on which CPp has developed probably contain very small amounts of particles less than 1 mm.

These data indicate that sediment particle composition is an essential factor determining the vegetation on the sandur.

The chemical composition of the upper 10 cm of sediment has been investigated from 43 quadrats. The results are presented in **Table 32**. Mean values ± SD have been calculated for the different vegetation types.

With few exceptions, the data indicate relatively small differences in the chemical composition of the sediments between the different vegetation types. The variation is often bigger within the quadrats belonging to one type, than between the types.

The general trend is for types growing on fine-graded sediments to have higher values for loss-on-ignition, cation exchange capacity, hydrogen ion concentration and magnesium concentration.

Not surprisingly, loss-on-ignition is highly correlated with hydrogen ion concentration. The high values of H in relation to cation concentration give a high correlation between H and cation exchange capacity, and a negative correlation with base saturation and pH. The lowest values of pH are found in the most stable vegetation types, i.e. AA and SNs. This indicates that the development of an organic humus layer to some extent influences the chemical composition of the sediments, but in general the sediment chemistry does not seem to be important for plant distribution and vegetation development on this sandur.

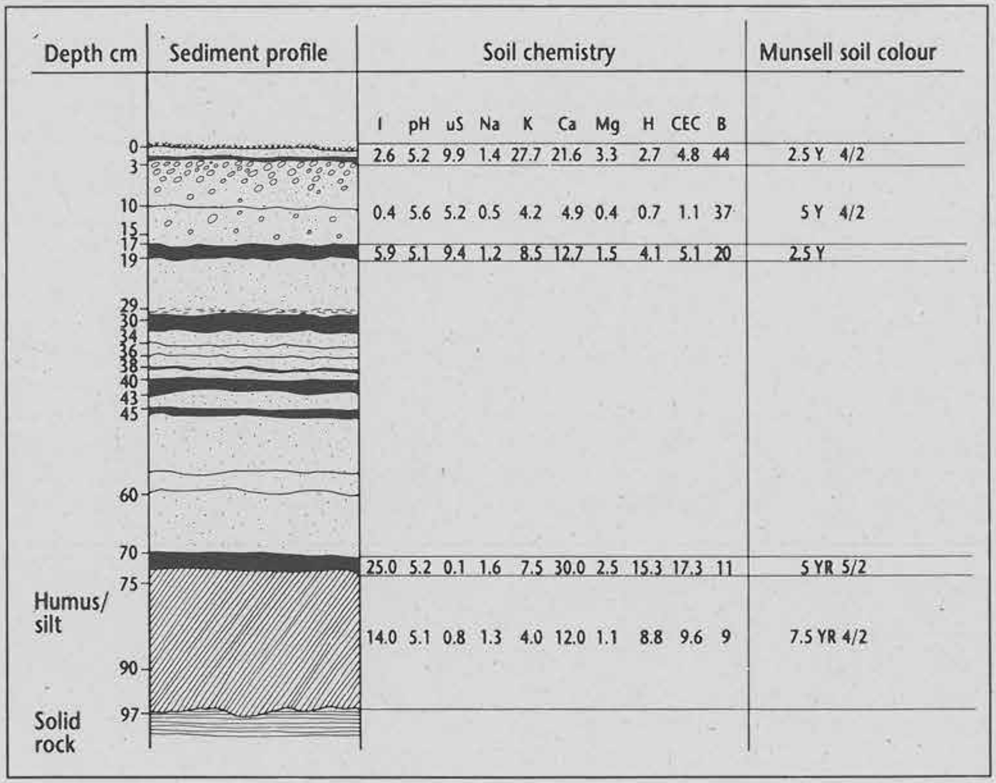


***Figure 15** Sediment profile from a* Salix-Carex rostrata *(SCr) vegetation type in the south-western part of the sandur. Soil chemistry and sediment particle composition in the different layers are indicated. Legends as in Figure 13. - Sedimentprofil i en* Salix-Carex rostrata *(SCr) bestand i de sørvestlige delene av sanduren. Jordkjemiske data og partikkelsammensetningen i ulike nivåer er angitt. Forklaring som i figur 13.*

***Table 31** Analysis of particle size composition in sediments from different quadrats on the sandur. Amount in each size class are given in percentage. - Kornfordelingsanalyser av overflatesedimenter i ulike vegetasjonstyper. Mengden av hver størrelseskategori er angitt i prosent.*

Quadrat	> 19 mm	16 mm	8 mm	4 mm	2 mm	1 mm	500 µm	250 µm	125 µm	< 125 µm	Type
17	0	0	0	0	0	0	1	3	10	86	
2	0	0	0	0	0	0	0	1	1	99	AA
3	0	0	0	0	0	0	0	1	1	99	
	0	0	0	0	0	0	0.3	2.0	4.0	94.7	Mean
							0.6	1.4	5.1	7.5	± SD
8	0	0	0	0	0	0	0	1	4	95	
228	0	0	0	0	1	0	0	0	1	98	
15	0	0	0	0	0	0	1	1	1	99	ADc
186	0	0	0	0	0	0	1	1	9	91	
185	0	0	0	0	0	0	0	1	1	99	
	0	0	0	0	0.3	0	0.5	0.8	3.2	96.4	Mean
					0.5		0.5	0.4	3.5	3.4	± SD
184	0	0	0	0	0	0	1	1	12	87	SCr
48	0	0	0	0	0	0	0	0	1	99	SNs
229	0	0	0	0	0	0	0	1	1	98	
227	0	0	0	0	0	0	0	0	1	99	
226	0	0	0	0	0	0	0	1	5	94	
225	0	0	0	0	0	0	0	1	7	92	SCn
179	0	0	0	0	0	0	1	3	10	86	
174	0	0	0	0	0	1	1	1	1	99	
30	0	0	0	0	0	1	1	1	7	89	
	0	0	0	0	0	0.3	0.4	1.1	4.6	93.9	Mean
						0.5	0.5	0.9	3.6	5.1	± SD
69	0	0	0	0	0	0	0	1	17	81	
68	0	0	0	0	0	0	1	2	27	70	
66	0	0	0	0	1	1	1	1	1	97	SPR
64	0	0	0	0	1	1	1	1	1	99	
59	23	9	20	15	11	5	2	5	8	2	
	4.6	1.8	4.0	3.0	2.6	1.4	1.0	2.0	10.8	69.8	Mean
	10.3	4.0	8.9	6.7	4.7	2.1	0.7	1.7	11.2	39.7	± SD

continue

***Table 31** continue*

Quadrat	> 19 mm	16 mm	8 mm	4 mm	2 mm	1 mm	500 µm	250 µm	125 µm	< 125 µm	Type
230	0	0	0	0	0	0	1	2	25	73	
146	0	0	0	1	1	1	1	6	23	69	
256	0	4	1	2	2	2	1	3	12	73	
232	0	0	0	0	0	1	3	16	22	58	
231	22	9	12	8	5	3	2	6	12	21	
128	0	0	0	1	5	8	12	26	28	20	
127	12	5	24	15	11	6	3	5	8	11	
122	13	9	20	14	8	6	5	4	7	14	
94	26	9	21	9	6	4	4	5	5	11	PB
93	29	5	19	12	7	3	1	2	6	16	
92	30	3	8	5	3	2	2	2	14	31	
91	0	8	16	8	4	3	3	4	24	30	
90	11	0	7	8	4	3	3	4	5	55	
89	0	0	0	0	0	1	2	6	21	71	
87	0	0	0	0	0	1	1	1	2	97	
86	0	0	0	1	0	1	1	1	16	80	
85	0	0	0	0	0	1	3	11	28	57	
	8.4	3.1	7.5	4.9	3.3	2.7	2.8	6.1	15.2	46.3	Mean
	11.5	3.7	9.1	5.3	3.4	2.2	2.7	6.4	8.8	28.4	± SD
224	0	0	0	0	0	0	1	1	12	87	
223	0	0	0	0	0	0	0	0	1	99	PE
88	0	2	10	5	5	4	6	9	16	43	
	0	0.7	3.3	1.7	1.7	1.3	2.3	3.3	9.7	76.3	Mean
		1.2	5.8	2.9	2.9	2.3	3.2	4.9	7.8	29.5	± SD
60	0	6	1	1	1	1	4	22	31	34	
57	0	0	0	0	1	1	1	6	23	68	SRS
	0	3	0.5	0.5	1.0	1.0	2.5	14.0	27.0	51.0	Mean
		4.2	0.7	0.7			2.1	11.3	5.7	24.0	± SD
109	44	3	14	7	5	3	4	4	5	11	
110	64	2	2	1	1	1	2	5	10	14	RS
	54.0	2.5	8.0	4.0	3.0	2.0	3.0	4.5	7.5	12.5	Mean
	14.1	0.7	8.5	4.2	2.8	1.4	1.4	0.7	3.5	2.1	± SD

Table 32 Chemical analysis of sediments from different quadrats on the sandur. Legends as in Table 30. - Kjemiske analyser fra overflatesedimenter fra de forskjellige vegetasjonstypene. Forkortelser som i tabell 30.

Quadrat	Ign	pH	Cond	Na	K	Ca	Mg	H	CEC	Base	Type
17	2.7	5.3	5.0	0.7	8.6	31.4	3.6	2.7	4.8	44.0	
2	5.3	4.7	7.5	1.0	16.7	5.1	10.9	5.0	8.9	44.0	AA
3	3.6	4.5	6.7	0.7	4.7	15.3	3.0	4.0	5.1	23.0	
	3.9	4.8	6.4	0.8	10.0	17.3	5.8	3.9	6.3	37.0	mean
	1.3	0.4	1.3	0.2	6.1	13.3	4.4	1.2	2.3	12.1	± SD
8	8.5	5.0	34.7	1.3	13.0	49.5	8.6	7.4	11.0	33.0	
16	11.0	5.1	32.4	1.0	16.5	59.8	9.1	7.8	12.0	35.0	
228	3.6	5.4	8.5	0.7	10.7	29.7	3.8	3.1	5.2	40.0	
221	8.3	5.1	57.4	1.1	17.7	39.8	7.4	7.4	10.5	30.0	ADc
15	3.0	4.7	31.0	0.3	5.1	22.4	4.4	3.0	4.6	35.0	
186	2.7	5.6	9.2	1.4	5.4	36.0	4.5	3.2	5.6	43.0	
185	4.3	5.1	7.4	1.4	6.4	32.7	4.6	3.0	5.2	43.0	
	5.9	5.1	25.8	1.0	10.7	38.6	6.1	5.0	7.7	37.0	mean
	3.3	0.3	18.5	0.4	5.3	12.6	2.2	2.4	3.3	5.1	± SD
83	2.6	5.2	9.9	1.4	27.7	21.6	3.3	2.7	4.8	44.0	SCr
184	0.5	5.2	10.9	0.7	6.1	16.1	1.1	0.9	2.0	54.0	
	1.6	5.2	10.4	1.1	16.1	18.9	2.2	1.8	3.4	49.0	mean
	1.5	0.0	0.7	0.5	15.3	3.9	1.6	1.3	2.0	7.1	± SD
48	2.6	5.1	11.4	1.2	10.8	24.0	3.5	2.6	4.4	41.0	SNs
26	7.0	5.0	36.7	1.9	28.2	99.9	7.7	4.6	11.0	58.0	
227	1.5	5.3	6.9	0.7	10.2	19.2	1.8	2.8	4.0	29.0	
226	1.3	5.1	8.4	0.5	8.9	19.5	1.4	1.6	2.9	46.0	
225	0.7	4.9	45.9	0.6	5.6	17.3	0.8	1.0	2.1	52.0	
179	0.5	5.4	4.9	0.4	3.2	10.1	0.4	0.5	1.1	56.0	SCn
174	3.8	5.6	32.4	0.7	7.8	28.3	3.9	2.9	4.9	40.0	
44	2.5	4.8	3.5	0.4	5.2	7.2	1.6	2.2	2.8	23.0	
42	11.0	5.4	65.0	1.7	17.0	93.4	2.5	6.2	11.6	46.0	
41	1.5	5.2	13.9	0.5	5.0	17.3	1.2	1.6	2.7	41.0	
30	1.0	5.3	11.4	0.7	9.2	16.5	1.1	1.2	2.4	50.0	
	3.1	5.2	22.9	0.8	10.0	32.8	2.2	2.5	4.6	44.1	mean
	3.4	0.3	21.0	0.5	7.5	34.1	2.2	1.8	3.7	11.3	± SD

continue

Table 32 continue

Quadrat	Ign	pH	Cond	Na	K	Ca	Mg	H	CEC	Base	Type
71	1.3	5.1	21.4	0.9	10.6	30.6	2.1	1.7	3.7	54.0	
69	0.2	6.3	15.0	0.4	3.9	6.2	0.4	0.4	0.9	53.0	
68	0.6	5.5	10.0	0.6	9.4	29.7	1.9	2.0	3.9	49.0	SPR
66	1.4	5.2	29.9	0.9	9.8	29.7	2.1	2.0	3.9	49.0	
64	2.5	5.1	13.4	0.7	9.4	65.3	3.1	2.3	6.1	62.0	
59	0.5	5.2	3.9	0.4	1.9	4.5	0.5	0.4	0.7	45.0	
	1.1	5.4	15.6	0.7	7.5	27.7	1.7	1.5	3.2	52.0	mean
	0.8	0.5	9.1	0.2	3.6	22.0	1.0	0.8	2.1	5.9	± SD
256	0.8	5.8	6.0	0.8	6.8	27.0	1.4	0.8	2.5	68.0	
230	0.7	5.3	5.7	0.3	4.0	11.4	0.8	1.2	2.0	38.0	
232	1.2	5.4	17.7	0.5	4.1	11.9	0.7	0.9	1.7	46.0	
231	0.7	5.4	9.7	0.5	4.5	9.4	0.6	0.9	1.6	42.0	PB
258	0.3	5.2	13.9	0.4	3.8	11.2	0.7	0.9	1.6	45.0	
128	0.4	5.5	9.0	0.4	2.6	7.3	0.3	0.6	1.1	44.0	
127	0.7	5.5	8.6	1.2	8.1	14.4	0.8	1.0	2.0	51.0	
122	0.4	5.2	16.9	0.5	3.2	7.2	0.5	0.4	0.9	56.0	
	0.7	5.4	10.9	0.6	4.6	12.5	0.7	0.8	1.7	48.8	mean
	0.3	0.2	4.7	0.3	1.9	6.3	0.3	0.2	0.5	9.5	± SD
224	0.6	6.1	13.0	0.6	5.2	61.2	0.9	0.5	3.8	87.0	
223	0.8	5.3	5.4	0.7	5.0	18.6	1.1	1.2	2.4	50.0	PE
222	0.6	5.7	4.7	0.9	9.0	22.1	2.8	3.6	5.2	31.0	
	0.7	5.7	7.7	0.7	6.4	34.0	1.6	1.8	3.8	56.0	mean
	0.1	0.4	4.6	0.2	2.3	23.6	1.0	1.6	1.4	28.5	± SD
60	0.6	5.3	9.4	0.4	4.8	8.2	1.0	0.9	1.5	41.0	SRS
57	1.2	5.1	5.2	0.5	6.0	8.0	0.8	1.7	2.3	27.0	
	0.9	5.2	7.3	0.5	5.4	8.1	0.9	1.3	1.9	34.0	mean
	0.4	0.1	3.0	0.1	0.8	0.1	0.1	0.6	0.6	9.9	± SD

7.2 Water level and vegetation

Obviously, the vegetation and its relationship to water level fluctuations is a very important ecological factor on the sandur. This effects both temperature conditions with the vegetation, erosion and sedimentation. In most parts of the sandur one can observe distinct zonations in the vegetation (see chapter 6), probably due to water level fluctuations. Some modification is, however, caused by the sediment type.

In order to elucidate the broad-scale relationships between water level and the distribution of the different vegetation types, the height differences have been measured using a levelling instrument. There are several difficulties and sources of error associated with such measurements. The main problem is the very variable water level with no permanent spot available to which heights may be referred. In order to get comparative values, all values measured have been converted to a specific water level. Therefore, before the measurements were carried out, the water- level at the actual site and time were recorded. Afterwards all values were converted to this zero level. The zero value is equal to a water-level of 270 on the Kroken water gauge. This value is close to the mean water level for June, July and August during the years 1984-87 (277.8 ± 17.0).

The sandur has been divided into 9 areas (**Figure 16**), in which the water fluctuations are fairly constant. Results of the measurements are given in **Table 33**.

The vegetation heights are referred to a mean water level. In the Table the difference between highest recorded water level and mean water level during 1985 is also given. This difference is very high in the southernmost parts, but more constant further than 500 m from the outlet where it is less than 20 cm.

The measurements have been concentrated on the shift between *Pohlia filum* with and without sporophytes which is the most distinct and widespread boundary on the sandur. The difference is very high in the southern part of the sandur, but further than 500 m from the outlet the values are fairly constant. The lower limit of *Pohlia filum* communities is situated more than 17 cm below this limit in the southern part, but in the northern part the difference is 6-9 cm. This indicates that it is not the mean water-level that determines the vegetation zonation, but merely some factors connected to the water-level fluctuations.

Figure 17 shows the vertical distribution of some vegetation types in relation to mean water-level, and distance from the outlet.

Based on these investigations, the different vegetation types may be arranged according to their height in relation to the water-level. The following order from water-level to the sandur top is found: on fine-graded sediments: PB(g) - PB(s) - PE - SCr - SCn - ADc - AA - SNs; on coarse sediments: PB/SPt - SR - SRS - CPp.

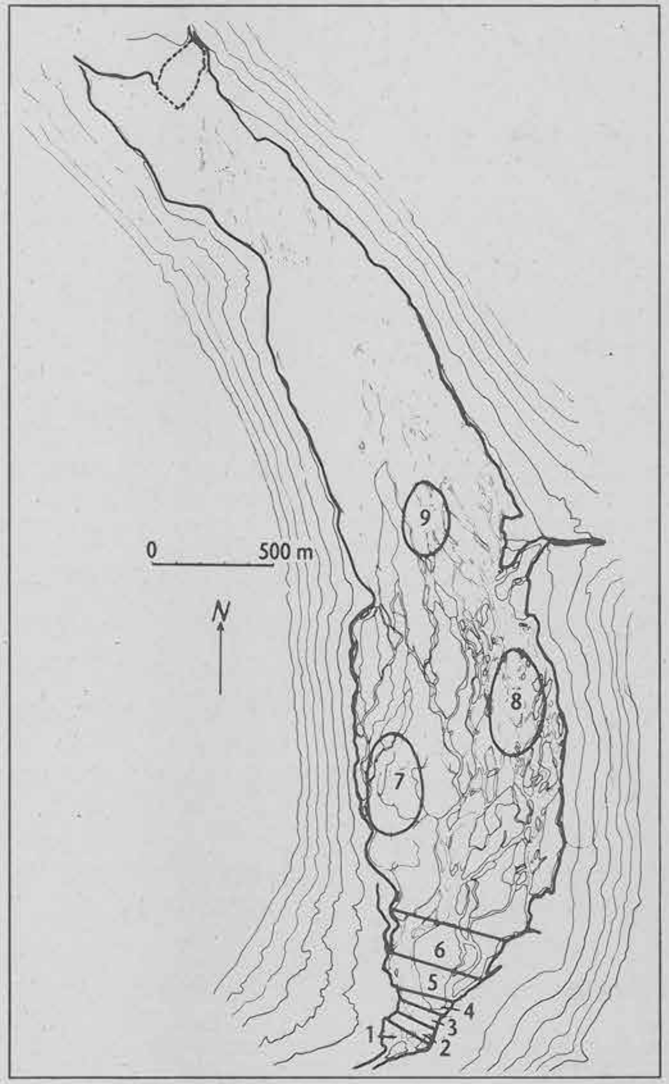


***Figure 16** Situation of the 9 areas where relations between vegetation type and water-level fluctuation have been investigated. - Delområder hvor det er foretatt målinger av vegetasjonsgrensenes høyde over vann-nivå.*

***Table 33** The distribution of vegetation types in relation to height abowe water-level in different sites of the sandur.*
PB(s) indicate Pohlia filum *with sporophyte, and PB(g) indicate* P. filum *with gemmae or sterile.*

Site	=	*Sandur area according to Figure 16. - Delområde i henhold til figur 16.*
M	=	*Approximately distanse from outlet (m). - Avstand fra utløpet av sanduren (m).*
dH	=	*Lower distribution of the vegetation types in relation to mean water-level. - Nedre utbredelsesgrense for vegetasjonstypen i relasjon til midlere sommervannstand (cm).*
SD	=	*Standard deviation. - Standardavvik.*
n	=	*Number of measurements. - Antall målinger.*
Diff. PB g/s	=	*Height difference between the PB(s)/PB(g) border and mean water-level. - Høydeforskjellen mellom PB(s)/PB(g) grensa og midlere sommervannstand (cm).*
Diff m/h	=	*Height difference between mean water-level and heighest recorded water-level during 1985. - Høydeforskjellen mellom midlere sommervannstand og høyeste sommervannstand sommeren 1985 (cm).*

site	M	veg. type	dH	± SD	n	diff. PB g/s	diff. m/h
1	5	PB(g)	54	7.8	7		
		PB(s)	79	7.8	7	25.4	75
2	100	PB(g)	45	6.9	6		
		PB(s)	65		1	20.0	60
		ADc	86		1		
3	200	PB(g)	23		1	20.0	44
		PB(s)	43		1		
		SNs	80		1		
4	250	PB(g)	10		1		
		PB(s)	27	3.8	3	17.0	29
		ADc	54	7.0	3		
5	300	PB(g)	11		1		
		PB(s)	28	6.4	5	17.1	25
		SRS	77		1		
6	500	PB(g)	10		1		
		PB(s)	18	4.4	10	8.1	20

continue

Table 33 *continue*

site	M	veg. type	dH	± SD	n	diff. PB g/s	diff. m/h
7	1050	PB(g)	8	3.8	6		
		PB(s)	17	3.9	12	9.3	20
		SCn	32	9.7	5		
		ADc	42	15.6	2		
		SNs	50	7.1	2		
8	1250	PB(g)	6	0.3	2		
		PB(s)	13	2.5	8	7.7	14
		SCr	18	6.7	7		
		SR	24	4.4	3		
		ADc	35	4.2	2		
9	2350	PB(g)	7		1		
		PB(s)	13	4.0	10	6.2	12
		SR	20	7.5	18		
		SRS	27	7.2	7		

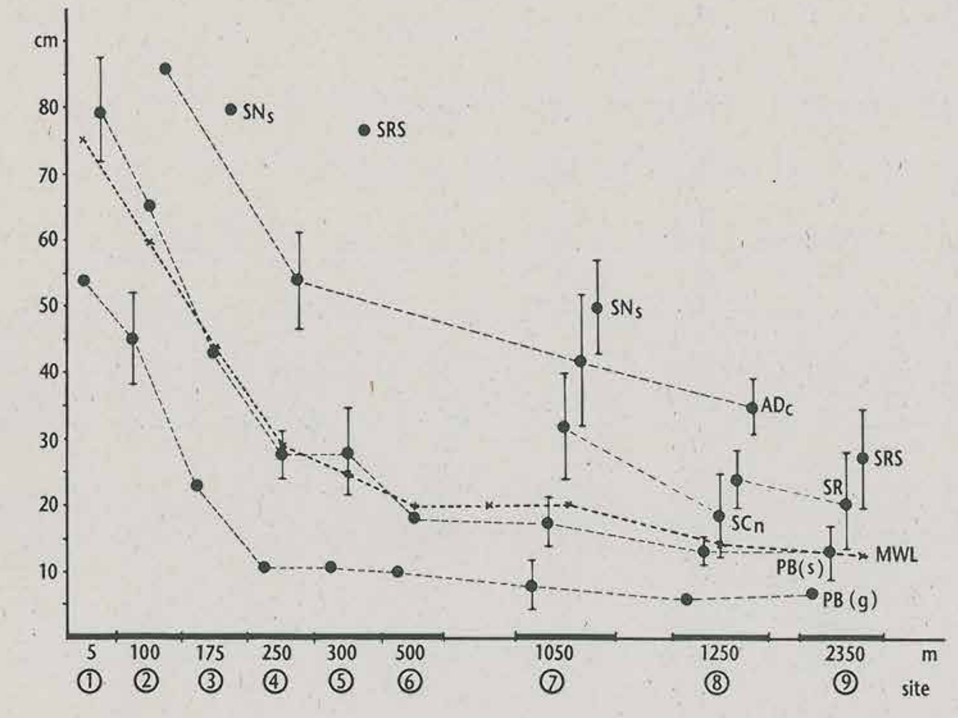


Figure 17 *Schematic diagram showing the relation between the vegetation types and their height abowe water-level in the investigated areas (cf. Figure 16 and Table 33). Maximum water-level during 1985 (MWL) is indicated. 0-level is water-level 27.7.1985, which lies close to the mean July water-level. - Skjematisk oversikt over nedre utbredelsesgrense for ulike vegetasjonstyper i relasjon til høyeste vann-nivå sommeren 1985 (MVL) i de 9 delområdene på sanduren (jf. figur 16 og tabell 33).*

7.3 Age of the investigated vegetation types

In order to derive some information on the age of the different investigated stands, growth rings of *Alnus incana*, *Betula pubescens* and *Salix* spp. were counted. This method cannot give accurate information about the length of vegetational developed as the actual plant may have started to grow a long time after the bottom and field layers were developed. However, in most cases seedlings of *Alnus incana* and *Salix* spp. are among the first plants to become established on a newly exposed site. The bottom and field layers may also have become covered with sand leading to a layer being established, whilst the tree and shrub layers survived. The growth rings may not therefore correspond to the actual age of the vegetation type.

In 1982 most of the *Alnus incana* trees in the southern part of the sandur were more than 50 years old. The oldest being over 80 years, but these were stouted and moribund. Towards north the age decreased, and in the northernmost forests the trees were younger than 10 years. The tallest *Salix* shrubs were 20-30 years old.

8 Standing crop and organic production

Table 24 presents the results of measurements of organic material within different vegetation types and different layers. The values indicate great variation in standing crop both within stands of the same type and between the different types.

In some of the types, e.g. SPR and SRS, the standing crop of the bottom layer is very high. In *Racomitrium canescens*-dominated vegetation values up to 1164 g/m^2 are found. These values also include dead material, but, nevertheless, there is a considerable standing crop of bryophytes on the sandur. There is also great variation between the different moss dominated types. The mean value for 5 quadrats dominated by *Racomitrium canescens* was 546 g/m^2, whereas for *Pohlia filum* it was much lower, 173 g/m^2.

The standing crop of the field layer is in general very low. In the PB, SPR and SRS types values are below 50 g/m^2. Within the AA type the standing crop of the field layer is between 250 and 380 g/m^2.

The shrub layer may have high standing crop values. The highest measured value is 2818 g/m^2.

The estimated values for the forest are low compared with other forest areas. The highest values are found within the AA type, with values over 2000 g/m^2.

The annual organic production has not been fully investigated, but the data collected do give some information. The main production occurs as a result of the development of a moss layer on exposed sediments. Sites which are developed during a 1 to 2 year period may have a standing crop higher than 1000 g/m^2.
The annual production of the field layer is, in general, exceptionally low.

The shrub and tree standing crops may be quite high, but the annual production is low. The *Salix* shrub reaches a height of 1-2.5 m within a 20 year period, and the 6 quadrats representing this type have a mean standing crop of approximately 1100 g/m^2. In the southernmost part of the area the *Alnus incana* trees are more than 50 years old, and reach a height of 5-7 m. These generally have a standing crop which varies between 1000 and 5000 g/m^2 indicating a rather low forest production.

***Table 34** Standing crop of different vegetation layers in different vegetation types. All values in g/m^2. - Biomassen i ulike vegetasjonssjikt i ulike vegetasjonstyper. Alle verdier i g/m^2.*

Veg. type Veg. type	Bottom layer Bunn-sjikt	Field layer Felt-sjikt	Shrub layer Busk-sjikt	Tree layer Tre-sjikt
PE		60		
		40		
		58		
PB	173			
	52			
	939	17		
SCn		114	212	785
			357	
		164	69	
	69	73	148	
	405	80	424	430
	737	17	400	
SCr		234		
SPR	1164	43	644	
	943	45	350	
			909	
			2818	
	725		1023	
SRS	550	38	298	
	381		1170	
SNs			1110	
ADc		241		903
		219		
AA		250-380		2070

9 Discussion

The variety of successional stages and vegetation zones give a high scientific value to this area. According to Moor (1958) it is essential to differentiate between these concepts. In Moor's sense a succession can only be said to have occurred when the vegetational communities have developed from each other, at the same place. A succession takes place in time, not in space. Zonation is defined as a topographic or climatic series: a series of vegetation communities in space.

In all the transects the same general pattern in vegetation zonation may be seen. In the lowermost parts of the river channels only scattered individuals of species such as *Salix nigricans* juv., *Deschampsia alpina*, *Deschampsia cespitosa*, *Phleum alpinum*, *Agrostis mertensii* and *Poa alpina* occur. There are some essential differences due to sediment type. *Juncus alpinoarcticulatus*, *Equisetum arvense*, *Eriophorum scheuchzeri*, *Pohlia filum*, and *Blasia pusilla* are most frequent on fine-graded sediments, while *Oxyria digyna*, *Salix nigricans* juv., *Saxifraga stellaris*, *Philonotis tomentella*, *Racomitrium ericoides* are most common on coarse sediments. At higher levels the vegetation cover, especially of mosses and lichens is thicker. This is due to vegetational succession. The vegetation in the lower areas must in most cases be re-established each year, whilst the vegetation at higher levels may exist for several years.

Fluvial processes are essential components of successional change on the sandur. The river erodes forested banks and deposits sand and silt bars which are then available for plant colonization. The spring and summer floods are constantly adding fresh alluvial material and eroding vegetation to produce new sites for plant establishment. Seasonal changes in water level control soil moisture, silt deposition, and seedling inundation and burial. The timing, intensity, and scale of the river disturbance determines the overall pattern of floodplain colonization.

Plant succession is initiated on bare floodplain sediments. The pioneer species appear to be able to maintain themselves in many of these sites as shown by the presence of the previous year's flowering stalks and leaves even though these areas show definite evidence of having been flooded. The most abundant pioneer species are *Deschampsia alpina*, *D. cespitosa*, *Agrostis mertensii*, *Phleum alpinum*, *Equisetum arvense*, *E. scheuchzeri*, and *Salix nigricans* juv. which may occur as scattered specimens. Most characteristic of the early succession stages is the development of a dense moss layer. Different types of mosses are often the first colonizers on exposed sediments. The sand layer becomes effectively bound together and stabilised by a dense system of moss rhizoids. *Racomitrium canescens* coll., *Polytrichum piliferum*, and *P. juniperinum* have efficient soil-binding qualities (Leach 1931). The early appearance of *Polytrichum* is very often due to the vegetative growth of small fragments of the moss that become lodged between the sediment particles. These fragments become anchored to the substratum by rhizoids, and send up new leafy shoots. *P. piliferum* has also been shown to cope with sand accumulation (Leach 1931: 100). *Racomitrium ericoides* has a different growth form: in the pioneer stage it forms small dense tufts, which in time develop into a dense carpet. These also act as sedimentary traps during flood conditions. On fine, wet sediments *Blasia pusilla* and *Pohlia filum* are the most important colonizers. A dense carpet of these mosses can often be found only few weeks after new sediments are exposed. On more coarse and wet sediments *Philonotis tomentella* is the main primary colonizer.

The pioneer communities are either dependent on or able to tolerate sedimentation or erosion activity which can not be endured by other vegetation types. Areas with silt and fine-graded sediments close to the water-level are generally homogenous, e.g. the EP and BP types. At higher levels the material may be coarser, because of stronger flow currents and more intensive bed transport and Rc is the pioneer community.

This investigation suggests that it is very difficult to separate changes due to alterations in river flow (zonations) from changes due to successional development because environmental conditions may change very quickly. Consequently, investigations of changes within permanent plots or transects which were intended to elucidate succession stages, may be found to be caused by minor changes in the environment, or both.

Succession should primarily be studied by continous monitoring of permanent plots where the environmental factors are constant. One may, however, assume that different successional stages within different successional pathways are represented at different sites on the sandur. On the basis of the TWINSPAN classification of the quadrat plots, combined with environmental data, one may point out some general successional relationships in the sandur vegetation.

The spatial distribution of the quadrats belonging to different TWINSPAN groups (**Figure 11**) may give some information concerning the stability and successional variation within each type. There are three groups with major variation: PB, SRS and ADc. Some of this variation may be due to different succession stages of the different quadrats in the actual type.

The PB type is the first to establish at any exposed site in which there are some fine-graded sediments. The further development of this vegetation depends upon its situation in relation to the daily water-level fluctuations. Sites situated on river-banks will remain at the same stage, while those situated at higher elevations will develop towards other types.

The counting of growth rings indicates that an *Alnus incana-D. cespitosa* vegetation may develop within a 20 year period. Later there will be a slow succession towards the *Alnus incana-Athyrium* spp. type in which the trees are more than 80 years old. As the humus layer develops in a ADc stand, different grasses, vascular plants and ferns will become established, and it may develop into the AA type. Some of the great variation within quadrats belonging to the ADc type (see **Figure 12**) may be assumed to represent a continous succession over more than 50 years.

Alnus incana can also form a tree layer in the SCn type, but it is unlikely that this vegetation will develop into the ADc type. SCn and ADc types are situated at different elevations in relation to the water-level, and they therefore represent different zones rather than different succession stages. However, if there is a change in water-level, a SCn type may develop into an ADc type.

The present investigations indicate that the major changes in vegetation composition occur during the first 0-2 years. After this period the height of shrubs and trees increases continously, but change in floristic composition is very slow, i.e. the main selection of species at each site occurs during the first years of colonization.

One may roughly distinguish three main succsession stages:

1 First succession stages (0-2 years):

The first species to invade bare soil after an area is exposed by erosion or sedimentation is *Blasia pusilla* (Odland et al. 1989). On wet and fine sediments it may become dominant over large areas less than one month after exposure. In the same habitats it is accompanied by scattered plants of *Pohlia filum*, *Agrostis mertensii*, *Equisetum arvense*, *Eriophorum scheuchzeri*, *Deschampsia alpina*, *Juncus alpinoarticulatus* and *Salix nigricans* (juv.). Some areas on the sandur, situated in riverbeds where the vegetation is flooded almost daily during the vegetation period, remain at this stage for several years. Such stands are represented within the AS, PE, PB, and SPt types. If there is an environmental change at such sites, a succession towards a new equilibrium stage will commence.

On wet coarse sediments *Pohlia filum*, *Racomitrium canescens* coll. and *Philonotis tomentella* are the first colonizers, see the Pt - type. On dry sediments the first colonisation by *Racomitrium ericoides* takes a much longer time (see the Rc-type).

2 Second succession stages:

After the first colonization stage there is a gradual increase of vascular plants and a decrease in *Blasia pusilla* and *Pohlia filum*. *Deschampsia cespitosa*, *Carex nigra*, *Eriophorum angustifolium*, *Carex nigra*, *C. rostrata*, *Juncus filiformis*, and *Salix nigricans* are the strongest competitors on moist and fine-graded sediments. After a relatively short time, stands similar to those represented within SCr, SCn, and ADc will develop.
On more coarse sediments *Racomitrium canescens* will continue its dominance for many years, but with an increasing frequency of species such as *Agrostis mertensii*, *Phleum alpinum*, *Luzula spicata*, *Lotus corniculatus*, *Salix lapponum*, *S. glandulifera*, *S. nigricans*, and *Stereocaulon* spp., see the SPR type.
This stage may last for 2-40 years in some types.

3 The "subclimax" stage:

In the stable parts of the sandur there are stands which have developed continously for more than 50 years (according to the age of the trees and willows). In areas with fine-graded sediments the pioneer species have normally become extinct and a thin layer of humus has developed. Typical species in such stands are *Alnus incana* (> 7 m high), *Nardus stricts*, *Athyrium distentifolium*, *A. filix-femina*, *Rhytidiadelphus squarrosus*, *Oxalis acetosella*, *Vaccinium myrtillus*, and *Trientalis europaea*. On coarse, dry sediments *Betula pubescens*, *Empetrum hermaphroditum*, *Calluna vulgaris*, *Vaccinium vitis-idaea*, *Stereocaulon* spp., and *Cladonia* spp. are characteristic. Stands which have developed for more than 50 years are represented within the SNs, AA, and CPp types.

4 Assumed further succession towards a "climax vegetation":

One may also suggest some further successions if vegetation on the sandur becomes more stabilised, but such development will not normally occur.

Without a change in water level the *Salix-Carex rostrata*, and *Salix-Carex nigra* types will probably remain the same except for an increasing dominance of *Alnus incana* in the latter. Floristically similar vegetation types are known from other parts of western Norway (e.g. Carici nigrae-Alnetum glutinosae, Fremstad 1983).

The ADc and AA will develop towards a typical Alno-Padion community with increasing frequency and abundance of vascular plants as the thickness of the organic layer increases.

SNs and SRS will probably evolve towards birch dominated Vaccinio-Piceion communities: the first towards a richer type with *Vaccinium myrtillus*, grasses, and small ferns, and the latter to a poor, dry type dominated by *Vaccinium myrtillus*, *Empetrum hermaphroditum* and lichens. In one of the quadrats belonging to SNs there was a *Betula pubescens* tree greater than 100 years old. This indicates that this stand must have been fairly stable for a long time.

CPp will probably develop into a Phyllodoco-Vaccinion community with *Betula pubescens*, *Empetrum hermaphroditum*, *Arctostaphylos alpinus*, and lichens.

10 Comparisons with other areas

Arctic and sub-arctic alluvial successions have been described from several areas. Most studies are, however, from North America and northern Russia and the flora is therefore quite different. However, the general trends in zonations and successions show some similarities.

Bliss & Cantlon (1957) studied alluvial vegetation along the Colville River in Alaska. The vegetation was divided into four communities: 1) a pioneer stage characterized by perennial herbs, 2) a vigorous willow stage dominated by *Salix alaxensis*, 3) a zone of deteriorating willow with increasing cover of lower-statured greenleaf willows, mosses and herbs and, 4) alder-willow-heath type. These four communities were considered to represent a successional series, arranged from youngest to oldest and from stream channel to terrace across a migrating meander.

Development of a climax ecosystem from an orginally unvegetated surface was investigated by Viereck (1966). Plant succession and soil development were described for a series of five stands on glacial outwash adjacent to the McKinley River in Alaska. The ages of four successional stands were estimated, on the basis of shrub growth, ring counts, and correlation with historical advances of other glaciers. Five successional stages were considered: 1) a pioneer stage (25-30 years) with small herbs, 2) a meadow stage (100 years) with willows, low shrubs and mosses (*Hylocomium splendens* and *Pleurozium schreberi*), 3) an early shrub stage (150-200 years) with small shrubs, mosses and lichens, 4) a late shrub stage (200-300 years), and a climax tundra stage (5000-9000 years) with *Betula glandulosa*, *Sphagnum warnstorfianum* and *Eriophorum vaginatum*.

Gorodkow (1944, cited from Bliss & Cantlon 1957) discussed the nature of plant succession on alluvial sites from Sibiria. He considered successions initiated on fresh alluvium to be of a secondary nature and pointed out that their development, in connection with the evolution of the entire landscape, tended to approach a single, but really diversified climax tundra of the western sector of the Arctic, the moss tundra. He described the initial stages on sandy alluvium as simple, with rarely more than 10 species, and dominated by horsetail. The first shrubs to invade these alluvial meadows were *Salix reptans* and *S. lanata*. This simple alluvial meadow stage was replaced by a shrub-moss alluvial meadow which had up to 15 species of moss, a few lichens, many grasses and sedges. The most important dwarf shrub was *Salix polaris*. The shrub layer, up to 50 cm, was mainly *Salix reptans* and *S. lanata* with some admixture of *Betula nana* and *Salix glauca*. This shrubby stage persisted for a long time, eventually giving way to a shrub-moss subclimax type on the terraces. Gorodkow emphasized the role of silting and flood erosion in limiting the composition of the lower layers of the floodplain and pointed out the decrease in depth of thaw associated with the development of the series. Many other variations to this basic sequence were described and attributed to edaphic or other differences.

Walker et al. (1986), investigating the processes in primary succession on an Alaskan floodplain, separated 7 main successional stages: 1 a bare-silt stage (0-5 years), 2 a vegetated-silt stage (5-7 years), 3 a willow (*Salix alaxensis*) stage (7-10 years), 4 a transition to alder (*Alnus tenuiflora*) stage (10-15 years), 5 an alder stage (15-30 years), a poplar (*Populus balsamifera*) stage (30-50 years), and 6 a spruce (*Pinus glauca*) stage (50-125 years).

Once colonization had occurred, a combination of growth rates and longevity could explain subsequent successional stages. There was almost simultaneous colonization by willow, alder, poplar, and spruce, with successive dominance and death, first, of the shortlived, rapid-growing willow and alder, followed by poplar, and finally the long-lived, more slow growing spruce.
From Scandinavia mountain deltaic vegetation succession has been investigated by Tengwall (1925), Polunin (1936), Dahlskog (1966, 1982a & b), and Aarrestad (1984). Polunin op cit. described 5 different stages in the psammosere successional series on dry sand: 1) a moss stage chiefly dominated by Polytricha, 2) a grass stage with *Festuca ovina*, 3) a ground-shrub stage with *Empetrum* spp. and *Arctostaphylos* spp., 4) a birch-*Empetrum* woodland, and 5) a climax birch forest with xeric ground vegetation (lichen enter and dominate in many areas).

Although the study indicates certain floristic differences between the different regions, the similarities in flora, vegetation and successional sequences are strong. In general, the successions on alluvial bars and banks seem to be initiated by a pioneer vegetation of perennial herbs, followed in areas of less flooding by shrubs which in turn are replaced by trees or by tundra meadow or marsh, depending upon the location. The species composition of the perennial herb pioneer vegetation and of the tundra meadows and marshes appear to be very similar. The tall shrubs and trees of the intermediate stages of the successions are often the same genera but different species.

On the Kvikkjokk Delta, in northern Sweden, a multidisciplinary research project including geomorphical, hydrological, and botanical studies was undertaken (Dahlskog et al. 1972). This boreal mountain-lake delta represents a highly dynamic system which, in part, shows similarities with the sandur.

Dahlskog (1966) investigated vegetational succession and sedimentation rates on the parts of the Kvikkjokk delta above normal summer low water level. According to Dahlskog several communities e.g. tall fern *Betula* forests or *Carex rostrata* vegetation were never found on sites with regular sedimentation. The pioneer communities, on the other hand, were dependent on sedimentation. The delta vegetation and succession did not show a direct relationship with sedimentation. But the study of plant communities (especially the bottom layer), together with the study of stratification in the uppermost parts of the soil profile, enabled close estimations of the sedimentation to be made (deviations within 10-20 % of the measured values).

The pioneer communities on silt and more fine-graded sediments on the sandur have several species in common with the early succession stages on sedimentation areas on the Kvikkjokk delta, e.g. *Eriophorum scheuchzeri*, *Equisetum arvense*, *Agrostis mertensii*, and *Blasia pusilla*. Important species on the Kvikkjokk delta such as *Carex aquatilis*, *Rubus arcticus*, *Calamagrostis stricta*, *Hierochlöe odorata*, *Astragalus alpinus*, and *Alopecurus aqualis* (Dahlskog 1966) have not been recorded on this sandur.
On the Laitaure delta in Sarek *Deschampsia alpina*, *Equisetum arvense*, *Calamagrostis neglecta*, *Juncus arcticus*, and *Eriophorum scheuchzeri* are the main pioneer species. In the second stage *Carex aquatilis* is the main species. At higher levels, mainly on sand, *Betula pubescens*, *Salix lanata*, *S. glauca*, *S. phylicifolia*, *Astragalus alpinus*, *Festuca ovina*, *Agrostis mertensii*, and *Bartsia alpina* are the most common species together with *Empetrum hermaphroditum*, *Arctostaphylos alpina*, *Vaccinium uliginosum*, *Racomitrium canescens*, *Polytrichum piliferum*, *Peltigera* sp. and *Stereocaulon* spp.

Successions on arctic and subarctic moraines are also similar to successions on coarse alluvial sediments, cf. Fægri (1933), Persson (1964), Elven (1978), Matthews (1978, 1979), Vetaas (1986). They are most closely related to the *Cladonia-Polytrichum piliferum* type, the *Racomitrium canescens* type, and the *Salix-Racomitrium-Stereocaulon* type.

From the north-eastern side of the Jostedal glacier Aarrestad (1984: 229) investigated the vegetation on two smaller sandurs. The sandur in Erdalen was situated 480 m a.s.l. Here *Alnus incana* plays an important role, and the vegetation is very similar to that on the Fåbergstølen sandur. The sandur in Tverrelvskaret is situated 930 m a.s.l., where *Salix* shrubs and moss communities are significant components of vegetation. On both these sandurs *Pohlia filum*, *Philonotis tomentella*, *Blasia pusilla*, and *Racomitrium canescens* coll. are all important in the first succession stages on newly exposed areas. In later stages dry heaths, *Salix* shrubs, *Alnus incana* forests or *Betula pubescens* forests develop.

Vegetation establishment and zonation on river banks described from Central Norway (Skogen 1972, Klokk 1980, 1981, Fremstad 1981, 1985) has been shown to be closely related to substrate type and height above water level. Succession pathways from newly exposed areas to stable vegetation types have been proposed. Klokk (1981) in his investigation of river bank vegetation from middle and upper parts of the river Gaula separated 17 groups of vegetation by the use of TABORD classification. These include vegetation on gravels and pebbles, moist habitats and fine-graded sediments, and vegetation only slightly influenced by erosion and sedimentation. Successional relationships between the groups are presented. Two main gradients were detected in the ordination, a fine-coarse grained substratum gradient, and an unstable-stable or low-high level gradient. Some of the vegetation types at the sandur show similarities with the river bank vegetation at higher elevations at Gaula:

Sandur vegetation types:	Gaula river bank vegetation:
Salix-Nardus stricta type	*Nardus stricta* meadow
Alnus-Deschampsia cespitosa type	Alno-Prunetum ribetosum
Salix-Pohlia-Racomitrium type	*Salix nigricans-Lotus corniculatus* type, stage II
Salix-Carex nigra type	*Salix glauca-S. lapponum* vegetation
Pohlia-Equisetum type	*Equisetum arvense* vegetation
Salix-Carex rostrata type	*Carex rostrata* vegetation

The river bank vegetation of the lower parts of the rivers Orkla, Gaula, Stjørdalselva, and Lågen (Skogen 1973, Klokk 1980, Fremstad 1981, 1985, Fremstad & Bevanger 1988) include several lowland species which do not occur on the sandur, but the main zonation patterns are similar.

11 Summary

1 The Fåbergstølsgrandane glaciofluvial floodplain, or sandur, is the largest, still active sandur on mainland Europe. It represents a historical record created during the deglaciation period which began some 9000 years ago.

2 Some of the vegetation types described from this sandur have not been recorded elsewhere in Scandinavia. These are mainly early succession stages after river erosion or sedimentation.

3 This floodplain represents a unique study site for population dynamics and vegetation succession. Each year new plant colonization takes place in areas where new sediments have been exposed due to erosion or sedimentation. In other parts there are sites which have been stable for more than 100 years.

4 The major change in vegetation composition occurs during the first 0-2 years after an area has been exposed. After this time floristic change is very slow if the environment remains unchanged.

5 Sites which are inundated by daily water-level fluctuations remain in the primary succession stage, but with an annual turnover in species.

6 A total of 165 vascular plant species have been recorded on the sandur. Of these *Myricaria germanica*, *Trisetum spicatum*, and *Salix glandulifera* are rare in Western Norway. The most common species are *Salix phylicifolia/nigricans*, *Racomitrium canescens* coll., *Agrostis mertensii*, *Pohlia filum*, *Salix lapponum*, *Phleum alpinum*, *Blasia pusilla*, and *Deschampsia cespitosa* which occurred in more than 50 % of the quadrat plots. The vascular plant flora is characterized by a high frequency of alpine plants, 38 % of the recorded.

7 Plants belonging to different "ecological groups" are restricted to more or less definite parts of the sandur. Low competitive alpine plants are more frequent in the northern part of the sandur, whilst forest and meadow species are restricted to the southern part. The western side of the sandur is richer in alpine species than the eastern side. Species such as *Salix glauca*, *S. herbacea*, and *Vahlodea atropurpurea* have only been recorded in the western part.

8 Viviparous species are common, e.g. *Poa alpina* var. *vivipara*, *Poa alpina* var. *vivipara* x *Poa flexuosa* (*Poa jemtlandica*), *Deschampsia alpina*, and *Festuca vivipara*.

9 The spatial distribution of sporophyte producing plants of *Pohlia filum*, and *Philonotis tomentella* in relation to their gemmiferous forms are very characteristic. The distribution of the gemmiferous plants show that they are mainly found at lower levels in the river-channels, where they are inundated during high water-level periods. The investigation indicates that the production of gemmae is an adaption to frequent flooding by cold water. Above a certain elevation, the floodplain may be coloured red by the sporophyte plants.

10 In general, the sandur may be characterized as a simple ecosystem, i.e. there are relatively few and quite easily recognizable factors determining the vegetational development. Relation to water level fluctuations, sediment type and time are by far the most important factors. Differences between the western and eastern sides of the sandur are probably due mainly to grazing, but locally there is also an effect of longlasting snow-lie, caused by avalanches and unfavourable aspect.

11 The zonation of vegetation is highly correlated with the sumrner water-level. The daily water-level fluctuations decrease northwards on the sandur, from approximately 70 cm by the outlet to approximately 15 cm in the central part.

12 Sediment type is also an important factor in determining the floristic composition and succession direction of exposed areas. On dry, coarse sediments the vegetational development is extremely slow, whilst om moist, fine-graded sediments the vegetational development is very rapid. Sediment composition and water-level explain most of the vegetation-environmental relationships.

13 The sediments on the floodplain are very poor in cations. Investigations of the soil chemistry in the upper layers indicate that pH and base saturation decrease as a result of vegetational development.

14 Sediment profiles indicate that this sandur has been active for a long time. In stable periods, a humus layer developed. After flooding with silt sedimentation, new vegetation became established. Organic layers separated by silt have been found down to approximately 1 m below the present surface. In the most stable vegetation stands today there is a 1 to 4 cm thick humus layer.

15 Grazing has been an important environmental factor in the southern and western parts of the sandur. This results in decreased tree and shrub layers, and a high frequency of species such as *Ranunculus acris*, *R. repens*, and *Trifolium repens*.

16 The organic production is in general low, but on newly exposed sediments there may be a high production of mosses, especially *Racomitrium canescens* coll.

12 Sammendrag

1 Fåbergstølsgrandane er den største gjenværende aktive sanduren på det europeiske fastlandet. Denne representerer et historisk dokument som er utviklet etter isavsmeltningsperioden som startet for ca. 9000 år siden i dette området.

2 Vegetasjonstyper som finnes her er ikke beskrevet fra andre områder i Skandinavia. Disse utgjør tidlige suksesjonsstadier etter erosjon eller sedimentasjon av breelvene som renner gjennom sanduren.

3 Denne sanduren representerer et unikt forskningsområde for å studere populasjonsdynamikk og vegetasjonssuksesjon. Hvert år starter nye vegetasjonsetableringer i områder som er blitt blottlagt ved flommer. I andre felter finnes vegetasjon som har vært stabile i mer enn 100 år.

4 De største endringene i vegetasjonen på en blottlagt flate skjer i løpet av de to første årene. Etter det skjer det en sakte, men gradvis endring i floraen dersom det ikke skjer endringer i de økologiske forholdene.

5 Lokaliteter som blir oversvømt ved de daglige vannstandsfluktuasjonene forblir, i et tidlig suksesjonstrinn, men det skjer en utskiftning av artene her hvert år.

6 Totalt er det registrert 165 forskjellige karplanter på sanduren (inkludert noen varianter). Av disse er klåved (*Myricaria germanica*), svartaks (*Trisetum spicatum*) og kjertelvier (*Salix glandulifera*) sjeldne i Vest-Norge. De mest vanlige artene er svartvier/grønnvier (*Salix nigricans/S. phylicifolia*), sandgråmose (*Racomitrium canescens*), fjellkvein (*Agrostis mertensii*), svartknoppnikkemose (*Pohlia filum*), lappvier (*Salix lapponum*), fjelltimotei (*Phleum alpinum*), flekkmose (*Blasia pusilla*), og sølvbunke (*Deschampsia cespitosa*) som fantes i mer enn 50 % av analyserutene. Karplantefloraen er karakterisert ved stort innslag av fjellplanter. Dette elementet utgjorde 38 % av artsantallet.

7 Planter tilhørende ulike "økologiske grupper" har sin hovedutbredelse i ulike deler av sandurflaten. Konkurransesvake alpine arter er mest vanlige i de nordlige delene, mens skog- og engarter vesentlig finnes i de sørlige delene. Vestsiden av sanduren har større frekvens av fjellplanter enn østsiden. Arter som sølvvier (*Salix glauca*), musøre (*S. herbacea*) og rypebunke (*Vahlodea atropurpurea*) er bare funnet på vestsiden.

8 Vivipare arter er svært vanlige. Det gjelder fjellrapp (*Poa alpina* var. *vivipara*), kryssningen mellom fjellrapp og mjukrapp (*Poa jemtlandica*), fjellbunke (*Deschampsia alpina*) og geitsvingel (*Festuca vivipara*).

9 Fordelingen av svartknoppnikkemose og grannkildemose, henholdsvis med sporofytt eller gemmae er meget karakteristisk på sanduren. I de lavestliggende partiene finnes bare planter med gemmae, mens det på noe høyere nivå kan finnes store mengder med sporofyttbærende planter. Seta og sporekapsler gjør at hele vegetasjonen får en intens rødfarge, noe som er lett observerbart på lang avstand. Dette skillet bestemmes av avstanden til vann-nivået. Gemmae utvikles i de områdene som oftest settes under vann.

10 Generelt sett må sanduren karakteriseres som et "enkelt" økosysten. Det er bare få og lett observerbare økologiske parametere som bestemmer vegetasjonsutviklingen her. Voksestedets høyde i relasjon til vannstandsvekslingene, sedimenttype og tidsfaktoren er helt avgjørende. De observerte forskjellene mellom vestsiden og østsiden er vesentlig betinget av beite og tråkk av husdyr. Lokalt er snøleieeffekt også av betydning på vestsiden.

11 Vegetasjonssonasjonen er best korrelert med midlere flomvannstand gjennom sommeren. Vannstandsvekslingene minker nordover, fra ca. 70 cm ved utløpet til ca. 15 cm i de sentrale delene av sanduren.

12 Partikkelsammensetningen i sedimentene er avgjørende for vegetasjonens sammensetning og utvikling. På grovt substrat er vegetasjonsetableringen og den videre utvikling svært langsom. På fuktig og finpartiklete sedimenter skjer etableringen meget raskt.

13 Sedimentene på sanduren er generelt svært fattige på metallkationer. Undersøkelsene viser at pH i de øvre sedimentlagene minker etter som vegetasjon utvikles.

14 Profiler i sedimentene viser at sanduren har lenge vært aktiv. I stabile perioder har det blitt utviklet et humuslag. Suksesive stabile perioder og flommer med påfølgende sedimentasjon vises i profilene som mørke organiske bånd mellon minerogene avsetninger. Slike organiske lag er påvist ned til ca. 1 m under nåværende overflate. I den mest stabile vegetasjonen som finnes på sanduren i dag, finnes et opp til 4 cm tykt humuslag over.sedimentene.

15 Beite og tråkk har vært en viktig økologisk faktor i de sørvestlige delene av sanduren fram til i dag. Dette er trolig grunnen til at det her finnes lite trær og vier, og at kulturindikatorer som engsoleie (*Ranunculus acris*), krypsoleie (*R. repens*) og kvitkløver (*Trifolium repens*) er vanlige.

16 Produksjonen av organisk materiale er generelt sett lav i området, men på nylig blottlagte flater skjer det en stor produksjon av moser, spesielt av sandgråmose.

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Appendix

Species list with abbreviations used in Tables and Figures. - Forkortelser av artsnavn brukt i tabeller og Figurer.

AGRO	CANI	Agrostis canina
AGRO	CAPI	Agrostis capillaris
AGRO	MERT	Agrostis mertensii
ALCH	ALPI	Alchemilla alpina
ALCH	VULG	Alchemilla vulgaris coll
ALEC	SPP.	Alectoria spp.
ALNU	INCA	Alnus incana
ANDR	POLI	Andromeda polifolia
ANGE	ARCH	Angelica archangelica
ANGE	SYLV	Angelica sylvestris
ANTH	JULA	Anthelia julacea
ANTh	JURA	Anthelia juratzkana
ANTH	ODOR	Anthoxanthum odoratum
ARCT	UVAU	Arctostaphylos uva-ursi
ATHY	DIST	Athyrium distentifolium
ATHY	FILI	Athyrium filix-femina
AULA	PALU	Aulacomnium palustre
BARB	BARB	Barbilophozia barbata
BART	ALPI	Bartisia alpina
BETU	PUBE	Betula pubescens
BLAS	PUSI	Blasia pusilla
BLIN	ACUT	Blindia acuta
BRAC	MILD	Brachythecium mildeanum
BRAC	REFL	Brachythecium reflexum
BRAC	RUTA	Brachythecium rutabulum
BRAC	SALE	Brachythecium salebrosum
BRAC	STAR	Brachythecium starkei
BRYU	SPP.	Bryum spp.
CALA	PURP	Calamagrostis purpurea
CALL	CORD	Calliergon cordifolium
CALL	SARM	Calliergon sarmentosum
CALL	STRA	Calliergon stramineum
CALL	VULG	Calluna vulgaris
CAMP	STEL	Campylium stellatum
CARD	BELL	Cardamine bellidifolia
CARE	BIGE	Carex bigelowii
CARE	BRUN	Carex brunnescens
CARE	CANE	Carex canescens
CARE	DIOI	Carex dioica
CARE	ECHI	Carex echinata
CARE	JUNC	Carex juncella
CARE	LACH	Carex lachenalii
CARE	LASI	Carex lasiocarpa
CARE	MAGE	Carex magellanica
CARE	NIGR	Carex nigra
CARE	PAUC	Carex pauciflora
CARE	ROST	Carex rostrata
CARE	RUFI	Carex rufina
CARE	SP.	Carex sp.
CEPH	SPP.	Cephalozia spp.
CEPH	SPP.	Cephaloziella spp.
CEPH	BIAM	Cephalozia bicuspidata subsp. ambigua
CEPH	BIBI	Cephalozia bicuspidata subsp. bicuspidata
CEPH	BICU	Cephalozia bicuspidata
CEPH	LUNU	Cephalozia lunuliflora
CERA	CERA	Cerastium cerastoides
CERA	FONT	Cerastium fontanum
CERA	PURP	Ceratodon purpureus
CETR	DELI	Cetraria delisei
CETR	ISLA	Cetraria islandica
CHIL	POLY	Chiloscyphus polyanthus
CICE	ALPI	Cicerbita alpina
CIRR	PILI	Cirriphyllum piliferum
CLAD	ARBU	Cladonia arbuscula
CLAD	BELL	Cladonia bellidiflora
CLAD	CHLO	Cladinia chlorophaea
CLAD	COCC	Cladonia coccifera
CLAD	CORN	Cladonia cornuta
CLAD	CRIS	Cladonia crispata
CLAD	DEFO	Cladonia deformis
CLAD	ECMO	Cladonia ecmocyna
CLAD	GRAC	Cladonia gracilis
CLAD	MACR	Cladonia macrophyllodes
CLAD	MITI	Cladonia mitis
CLAD	SPP.	Cladonia spp.
CLAD	PHYL	Cladonia phyllophora
CLAD	PITY	Cladonia pityrea
CLAD	PLEU	Cladonia pleurota
CLAD	PYXI	Cladonia pyxidata
CLAD	RANG	Cladonia rangiferina
CLAD	STRI	Cladonia stricta
CLAD	UNCI	Cladonia uncialis
CLAD	VERT	Cladonia verticillata
CORA	TRIF	Corallorhiza trifida
DACT	MACU	Dactylorhiza maculata
DESC	ALPI	Deschampsia alpina
DESC	CESP	Deschampsia cespitosa
DESC	FLEX	Deschampsia flexuosa
DICR	FUSC	Dicranum fuscescens

DICR	PALU	Dicranella palustris
DICR	SCOP	Dicranum scoparium
DICR	SUBU	Dicranella subulata
DITR	PUSI	Ditrichum pusillum
DREP	BADI	Drepanocladus badius
DREP	EXAN	Drepanocladus exanulatus
DREP	EXAP	Drepanocladus exanulatus subsp. purpascens
DREP	REVO	Drepanocladus revolvens
DREP	UNCI	Drepanocladus uncinatus
DROS	ANGL	Drosera anglica
DROS	RORU	Dorsera rotundata
DRYO	CART	Dryopteris carthvsiana
DRYO	EXPA	Dryopteris expansa
EMPE	HERM	Empetrum hermaphroditum
EMPE	NIGR	Empetrum nigrum
EPIL	ANAG	Epilobium anagallidifolium
EPIL	HORN	Epilobium hornemannii
EPIL	SP.	Epilobium sp.
EQIU	PRAT	Equisetum pratense
EQUI	ARVE	Equisetum arvense
EQUI	FLUV	Equisetum fluviatile
EQUI	PALU	Equisetum palustre
EQUI	SYLV	Equisetum sylvaticum
ERIO	ANGU	Eriophorum angustifolium
ERIO	SCHE	Eriophorum scheuchzeri
ERIO	VAGI	Eriophorum vaginatum
EUPH	FRIG	Euphrasia frigida
EURH	SP.	Eurhynchium sp.
FEST	VIVI	Festuca vivipara
GERA	SYLV	Geranium sylvaticum
GEUM	RIVA	Geum rivale
GNAP	NORV	Gnaphalium norvegicum
GNAP	SUPI	Gnaphalium supinum
GYMN	CONC	Gymnomitrium concinnatum
GYMN	DRYO	Gymnocarpium dryopteris
HARP	FLOT	Harpanthus flotowianus
HEPA	TSPP	Hepaticae spp.
HIER	SPP.	Hieracium spp.
HUPE	SELA	Huperzia selago
HYGR	TAXI	Hygrobiella taxifolia
HYLO	PYRE	Hylocomium pyrenaicum
HYLO	SPLE	Hylocomium splendens
HYLO	UMBR	Hylocomium umbratum
JUNC	ALPI	Juncus alpinoarcticulatus subsp. nodulosus
JUNC	ARTI	Juncus articulatus
JUNC	FILI	Juncus filiformis
JUNC	TRIF	Juncus trifidus
KIAE	GLAC	Kiaeria glacialis
KIAE	STAR	Kiaeria starkei
LECI	GRAN	Lecidia granulosa
LEON	AUTU	Leontodon autumnalis
LEPR	NEGL	Lepraria neglecta
LIST	CORD	Listera cordata
LOPH	ALPE	Lophozia alpestris
LOPH	NCI	Lophozia incisa
LOPH	WENZ	Lophozia wenzellii
LOPH	SPP.	Lophozia spp.
LOTU	CORN	Lotus corniculatus
LUZU	FRIG	Luzula frigida
LUZU	MULT	Luzula multiflora
LUZU	PILO	Luzula pilosa
LUZU	SPIC	Luzula spicata
LUZU	SUDE	Luzula sudetica
LYCO	SELA	Lycopodium selago
MARC	ALPE	Marchantia alpestris
MARS	EMAR	Marsupella emarginata
MARS	SPAR	Marsupella sparsifolia
MARS	SPHA	Marsupella sphacelata
MARS	SPP.	Marsupella spp.
MASS	CARN	Massalongia carnosa
MELA	PRAT	Melampyrum pratense
MELA	SYLV	Melampyrum sylvaticum
MILI	EFFU	Milium effusum
MOER	BLYT	Moercia blyttii
MOLI	CAER	Molinia caerulea
MONT	LAMP	Montia lamprosperma
NARD	COMP	Nardia compressa
NARD	GEOS	Nardia geoscyphus
NARD	SCAL	Nardia scalaris
NARD	STRI	Nardus stricta
NART	OSSI	Narthecium ossifragum
OLIG	HERC	Oligotrichum hercynicum
ORTH	FLOE	Orthocaulis floerkei
ORTH	SECU	Orthilia secunda
OXAL	ACET	Oxalis acetosella
OXYC	MICR	Oxycoccus microcarpus
OXYR	DIGY	Oxyria digyna
PARI	QUAD	Paris quadrifolia
PELL	SP.	Pellia sp.
PELT	APTH	Peltigera apthosa
PELT	CANI	Peltigera canina
PELT	SPP.	Peltigera spp.
PELT	POLY	Peltigera polydactyla
PHIL	FONT	Philonotis fontana
PHIL	SERI	Philonotis seriata
PHIL	TOME	Philonotis tomentella

PHIL	TOMS	Philonotis tomentella plants with sporophytes
PHLE	ALPI	Phleum alpinum
PHYL	CAER	Phyllodoce caerulea
PING	VULG	Pinquicula vulgaris
PINU	SYLV	Pinus sylvestris
PLAG	ELLI	Plagiomnium ellipticum
PLEU	ALBE	Pleurodada albescens
PLEU	SCHR	Pleurozium schreberi
POAA	LPIN	Poa alpina
POAA	NNUA	Poa annua
POAF	LEXU	Poa flexuosa
POAG	LAUC	Poa glauca
POAP	RATE	Poa pratensis
POAV	IVIP	Poa vivipara
POGO	URNI	Pogonatum urnigerum
POHL	BULB	Pohlia bulbifera
POHL	CRUD	Pohlia cruda
POHL	DRUM	Pohlia drummondii
POHL	FILS	Pohlia filum plants with sporyphytes
POHL	FILU	Pohlia filum
POHL	SP.	Pohlia sp.
POHL	NUTA	Pohlia nutans
POHL	OBTU	Pohlia obtusifolia
POHL	WAHL	Pohlia wahlenbergii
POLY	ALPI	Polytrichum alpinum
POLY	COMM	Polytrichum commune
POLY	JUNI	Polytrichum juniperinum
POLY	PILI	Polytrichum piliferum
POLY	SEXA	Polytrichum sexangulare
POLY	VIVI	Polygonum viviparum
POTE	EREC	Potentilla erecta
POTE	PALU	Potentilla palustre
PRUN	PADU	Prunus padus
PSEU	CINC	Pseudobryum cinclidioides
PTIL	CILI	Ptilidium ciliare
PYRO	MINO	Pyrola minor
RACO	ACIC	Racomitrium aciculare
RACO	AFFI	Racomitrium affine
RACO	CANE	Racomitrium canescens
RACO	LANU	Racomitrium lanuginosum
RACO	MICR	Racomitrium microcarpon
RANU	ACRI	Ranunculus acris
RANU	GLAC	Ranunculus glacialis
RANU	REPE	Ranunculus repens
RHIZ	MAGN	Rhizomnium magnifolium
RHIZ	PSEU	Rhizomnium pseudopunctatum
RHIZ	PUNC	Rhizomnium punctatum
RHOD	ROSE	Rhodobryum roseum
RHYT	SQUA	Rhytidiadelphus squarrosus
RHYT	SUBP	Rhytidiadelphus subpinnatus
RIBE	UVAC	Ribes uva-crispa
RICC	PING	Riccardia pinguis
RUBU	CHAM	Rubus chamaemorus
RUME	ACET	Rumex acetosa
SAGI	SAGI	Sagina saginoides
SALI	GLAN	Salix glandulifera
SALI	GLAU	Salix glauca
SALI	HERB	Salix herbacea
SALI	LAPP	Salix lapponum
SALI	NIGR	Salix nigricans
SAXI	STEL	Saxifraga stellaris
SCAP	SPP.	Scapania spp.
SCAP	CURT	Scapania curta
SCAP	HYPE	Scapania hyperborea
SCAP	IRRI	Scapania irrigua
SCAP	IRRR	Scapania irrigua subsp. rufescens
SCAP	OBCO	Scapania obcordata
SCAP	OBSC	Scapania obscura
SCAP	PALU	Scapania paludosa
SCAP	SUBA	Scapania subalpina
SCAP	ULIG	Scapania uliginosa
SCAP	UNDU	Scapania undulata
SCIL	PALL	Sciloscyphus pallescens
SCIR	CAES	Scirpus cespitosus
SELA	SELA	Selaginella selaginoides
SILE	ACAU	Silene acaulis
SILE	RUPE	Silene rupestris
SOLE	SP.	Solenostoma sp.
SOLE	OBOV	Solenostoma obovata
SOLE	SPNA	Solenostoma sphaerocarpa var. nana
SOLE	SUBE	Solenostoma subelliptica
SOLI	VIRG	Solidago virgaurea
SOLO	CROC	Solorina crocea
SORB	AUCU	Sorbus aucuparia
SPHA	AUAU	Sphagnum auriculatum subsp. auriculatum
SPHA	COMP	Sphagnum compactum
SPHA	GIRG	Sphagnum girgensohnii
SPHA	SPP.	Sphagnum spp.
SPHA	LIND	Sphagnum lindbergii
SPHA	MAGE	Sphagnum magellanicum
SPHA	NEMO	Sphagnum nemorum
SPHA	PALU	Sphagnum palustre
SPHA	PAPI	Sphagnum papillosum

SPHA	RIPA	Sphagnum riparium
SPHA	RUBE	Sphagnum rubellum
SPHA	RUSS	Sphagnum russowii
SPHA	SQUA	Sphagnum squarrosum
SPHA	TENE	Sphagnum tenellum
SPHA	TERE	Sphagnum teres
STEL	CALY	Stellaria calycantha
STEL	NEMO	Stellaria nemorum
STER	SPP.	Stereocaulon spp.
STER	GLAE	Stereocaulon glaerosum
STER	GRAN	Stereocaulon grande
STER	RIVU	Stereocaulon rivulorum
STER	TOME	Stereocaulon tomentosum
TARA	SPP.	Taraxacum spp.
THEL	PHEG	Thelypteris phegopteris
TOFI	PUSI	Tofieldia pusilla
TRIE	EURO	Trientalis europaea
TRIG	PALU	Triglochin palustre
TRIT	QUIN	Tritomaria quinquedentata
VACC	MYRT	Vaccinium myrtillus
VACC	ULIG	Vaccinium uliginosum
VACC	VITI	Vaccinium vitis-idaea
VAHL	ATRO	Vahlodea atropurpurea
VALE	SAMB	Valeriana sambucifolia
VIOL	PALU	Viola palustris

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