GRØNLANDS FISKERI- OG MILJØUNDERSØGELSER

# Botaniske undersøgelser i Jameson Land, 1983

GRØNLANDS BOTANISKE UNDERSØGELSER

Februar 1984

Forside: Blomstrende hanplante
af arktisk pil (*Salix arctica*).
Foto: Sune Holt, 1982

Grønlands Fiskeri- og Miljøundersøgelser
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# BOTANISKE UNDERSØGELSER I JAMESON LAND, 1983

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INDHOLDSFORTEGNELSE

Sammendrag

De botaniske undersøgelser i Jameson Land, 1983, som er udført af Grønlands Botaniske Undersøgelser, består af:

1) Vegetationskortlægning ved felttolkning af falskfarvede infrarøde flybilleder.
2) Undersøgelser af All Terrain Vehicle (ATV) og All Terrain Cycle (ATC) kørsels indvirkning på vegetation og jordbund.
3) Undersøgelser af testseismiks indvirkning på vegetation og jordbund.
4) Undersøgelser af vegetationens følsomhed over for diesel- og råoliespild.

1) Størstedelen af feltarbejdet i 1983 blev anvendt til vegetationskortlægning. De falskfarvede flybilleder, som blev optaget i 1982 (reproduceret i skala ca. 1:25.000), dannede grundlag for kortlægningen.

Felttolkningen af billedmaterialet fandt sted i 11 udvalgte områder, og et stort materiale om de klassificerede vegetationstypers udbredelse og floristiske sammensætning på Jameson Land er indsamlet. Ved felttolkningen er der arbejdet med 14 vegetationstyper og 4 typer af vegetationsløse områder.

På grundlag heraf har det været muligt at lave en foreløbig og forenklet vegetationsbeskrivelse og et tilhørende vegetationskort, som dækker størstedelen af Jameson Land.

På dette kort er kun medtaget de hovedvegetationstyper, som er arealmæssig dominerende eller udgør vigtige tilholds- eller fourageringsområder for gæs og moskusokser. Afgræsningen af de enkelte typer er kun angivet i grove træk.

Vestsiden af Jameson Land fra kysten til ca. 200 meterniveauet domineres af sammenhængende dværgbuskhede. Større områder med fugtig, mosrig dværgbuskhede findes i de store dale på østsiden af Jameson Land, og på vestsiden findes denne type især i den nordligste del. Den østlige del er domineret af sparsom vegetation: snelejer og fjeldmark eller vegetationsløse områder. Den største koncentration af søer og damme findes på vestsiden af Jameson Land og i forbindelse med disse findes mange kær. Den sydligste femtedel af Jameson Land er endnu ikke undersøgt.

Eksempler på vegetationskort for udvalgte områder findes på side 15-17.

På de undersøgte lokaliteter er der lavet vegetationsanalyser i de vigtigste vegetationstyper (i alt 108 analyser), og 1100 kollektioner af blomster- og karsporeplanter er indsamlet som belæg for vegetationskortlægningen. I alt er der fundet 186 plantearter.

En floraliste over alle registrerede plantearter er udarbejdet, og hyppigheden af de enkelte arter/taxa i de undersøgte områder er angivet ved en 5 trins skala 1: meget sjælden, 2: sjælden, 3: hist og her, 4: almindelig og 5: meget almindelig.

2) Undersøgelserne af All Terrain Vehicle (ATV) og All Terrain Cycle (ATC) kørsels indvirkning på vegetation og jordbund er behandlet i en selvstændig rapport fra Grønlands Fiskeri- og Miljøundersøgelser.

3) I forbindelse med de testseismiske undersøgelser i 1982 fandt botaniske undersøgelser sted. Prøvefelterne blev undersøgt før og efter sprængningen, og skade på vegetation og jordbund blev registreret. Det følgende år blev området besøgt, og vegetationens regeneration blev registreret.

Skadens omfang afhænger hovedsagelig af jordens tekstur og humusindhold. Den største skadelige effekt af overfladesprængninger ses på vegetation, som vokser i et tyndt, humøst jordlag på stenet grund. Vegetation på siltet jordbund med et tyndt humuslag har vist sig at være mindre sårbar.

Arterne udviser forskellig følsomhed over for overfladesprængning. Arktisk pil fremstår som den mindst sårbare af dværgbuskene. Græsser, halvgræsser og urter med en tueformet vækst klarer sig bedre end de øvrige dværgbuske. I alle prøvefelterne er dækningsgraden reduceret til ganske få procent.

4) Forsøg med spild af råolie og dieselolie blev foretaget i 5 vegetationstyper ved Mesters Vig. De foreløbige undersøgelser tyder på, at enkelte individer af arktisk pil og halvgræsser i nogen grad er i stand til at overleve spild af råolie, mens dieselolien derimod virker dræbende på næsten al vegetation.

nailisarnera

Jameson Land-ime 1983-ime naussunik misigssuinerit Grønlands Botaniske Undersøgelser-nit ingerdlánekartut mákûsimáput:

1) tingmissartunît ássilissat kíngornerit kíssartut atordlugit pissut "kúkûssumik kalipautigdlit" sumîvfingme misigssornerisigut naussut sûnerinik agdlagtuinerit.
2) All Terrain Vehicle (ATV) ãma All Terrain Cycle (ATC) ingerdlassarnerisa naussunut nunavdlo ivssortânut kanok súniutekarneránik misigssuinerit.
3) sajugpitdlagtitsiníkut kârtiterinerit naussunut nunavdlo ivssortânut kanok súniutekarnerinik misigssuinerit.
4) diesseloliep råolievdlo maungáinarsimassut naussunut kanok súniutekartarnerinik misigssuinerit.

1) sumîvfik tikitdlugo 1983-ime sulinerup angnerssâ naussut sûneránik agdlagtuineruvok. tingmissartumît ássilissat sujulîne erkartornekartut 1982-ime ássilissausimassut (angíss. 1:25.000) tamatumane túngaviginekarnerusimáput.
taimatut naussorsiornerit sumîvfingne ingmíkut torkagkane 11-ne pisimáput, tamatumûnalo Jameson Land-ime naussut sûnerat kanok ítúkûtârtûvdlutigdlo naokatigîgtarnerat pivdlugit pâsíssutigssarpâlugssuit pinekarsimáput. tamatumane naussokatigîgkûtât 14 sumîvfîtdlo naussokarfiúngitsut 4 misiggsugarinekarsimáput.
tainekartut túngavigalugit Jameson Land-ip ilarujugssuata naussue taimáitûgatdlartumik ajornaitdlisagaussumigdlo agdlagtornekarsimavdlutigdlo ássiliornekarsimáput.
nunap ássingane matumane naussokatigîgkûtât pingârnerit ãmalo nerdlerit umingmaitdlo nerissagssakarniarneránut pingârutekartûnerussut ilángúnekarsimáput. ãma naussokatigîgkûtât atausiákât kanok kigdlekartiternere takússutigssiáinavînerussumik ilángússáuput.
Jameson Land-ip kitâtungâ sinerissamît tímut 200 m patdligdlugit avâlakíssanik naussokartiterneruvok. Jameson Land-ivdle kangiatungâne kôrossuarne isugutassune ivssuatsiae-

ĸardluartunik avâlaĸiaĸartiterpoĸ, kitâtungâtale avangnâtungâ ãma taimáitoĸartiterdlune. kangiatungâ naussoĸarpiángilaĸ: apuleĸarnerssat ãma ĸáĸaĸarnerssat narssaumanertagdlit tauvalo nunap ilarujugssue naussuitsut. Jameson Land-ip kitâtungâ taseĸartiterdlunilo tasínguaĸartiterneruvoĸ tamákualo erĸât isugutanerssaĸartiterdlune. Jameson Land-ip kujatâtungâ tatdlimararterutigissâ sule misigssorneĸángilaĸ.

nunap ilaisa ĸanoĸ naussoĸartiternerinut takússutigssat kúp. 7-9-nĩput. nunap ilaine misigssorneĸarsimassune naussoĸatigîgkûtât sûnere misigssorĸigsârneĸarsimáput (katitdl. ássigĩngitsut 1o8), tauvalo naussut kingunigssartatdlo 1loo katerssorneĸarsimáput ássiliortiternerne túngavigineĸarumârtugssatut. naussut ássigĩngitsut katitdlugit 186 navssârineĸarsimáput.

naussut navssât ingmíkôrtiterneĸarsimáput ĸanoĸ takugssautiginere maligdlugit ingmíkôrtiterneĸarsimavdlutik: 1:ĸaĸutigôrtorujugssuaĸ, 2: ĸaĸutigôrtoĸ, 3: tamane tamâne takugssaussoĸ, 4:nalingínaussoĸ tauvalo 5: nalingínaussorujugssuaĸ.

2) All Terrain Vehicle (ATV) ãma All Terrain Cycle (ATC) ingerdlassarnerisa naussunut nunavdlo ivssortainut ĸanoĸ súniuteĸartarnerat pivdlugo Grønlands Fiskeri- og Miljøunderseøgelser ingmíkut nalunaerusiorsimavoĸ.

3) 1982-ime sajugpitdlagtitsiníkut misigssuinermut atassumik naussunik misigssuissoĸarsimavoĸ. sumîvfît misilîvfiussut kârtitsinerup sujornatigut kingornatigutdlume misigssorneĸarput tauvalo naussut nunavdlo ivssortâta ínardliutait nalunaerssorneĸardlutik. áipâguane nunap ilâ pineĸartoĸ takusarĸingneĸarpoĸ naussutdlo naorĸigtitersimanerat misigssorneĸardlune.

ínardligaunerup ĸanoĸ angnertutigineranut aulajangîssûnerussut tássáuput ivssup ĸanoĸ ítûnera tauvalo sananeĸautinik naussoĸarfiusínaussunik asiunikunik ĸanoĸ akoĸartiginera. nunap kâvata kârtitigauneratigut ínardlerneĸarnerusimaput naussut ivssume sãtume (sáungúme) ujaragtûlingmĩtut. pâsinarsivoĸ naussut ivssume sãtumik sáungutitalingme naussartut ínardliáinerussut.

naussut ássigĩngitsut nunap kâvata kârtitigauneranut ássigĩngitsumik akiûsínáussuseĸarput. orpigkanit ínardliáinerpauvoĸ ssêĸ.

ivigkat, ivigaussat (halvgræsser) tauvalo naussut pingutangnut erkainartunik naussartut orpgârkanit avdlanit ínardliáinerúput. nunap ilaine misilîviussune tamane matussisínáussusekarnek procentinut ikigtuararssuarnut migdleriarsimavok.

4) ûliamik sukuluiarnekángitsumik (råolie) ãma ûliamik ingerdlatigssamik (dieselolie) maungáinartitsivdlune misilînerit Mesters Vigip erkâne naussokatigîgkûtaine ássigîngitsune tatdlimane pisimáput. misigssuinerugatdlartut takutíkunarpât orpigkat atausiákât ãma ivigaussat ilâtigut ûliamut sukuluiarnekángitsumut akiũsínáussusekartut, ûliale ingerdlatigssak nausínáussusilingnut tamardluínangajangnut tokunartûssok.

English summary

The botanical investigations in Jameson Land, 1983, carried out by Greenland Botanical Survey, consist of:

1) Vegetation mapping based on field interpretation of aerial false colour infrared photos.

2) Investigations of the effects on vegetation and soil by driving All Terrain Vehicle (ATV) and All Terrain Cycle (ATC).

3) Investigations of the effects on vegetation and soil of seismic surface shooting.

4) Investigations of the effects of crude- and diesel oil spills on different vegetation types.

1) The main part of the field work in 1983 was dedicated to vegetation mapping. The false colour photos made during the summer 1982 (scale approximately 1 : 25.000) were used in the mapping work.

The vegetation mapping took place in 11 selected areas, and an amount of material on distribution of the vegetation types and their floristic composition was gathered. 14 vegetation types and four types of areas without vegetation (impediments) were used in the vegetation mapping.

Concurrently with a detailed vegetation mapping in progress including the 11 selected areas, a preliminary large-scale vegetation map showing the most dominant vegetation types of the major part of Jameson Land is presented. These vegetation types are characterized either by having a great distribution or by being important haunts or fouraging habitats. Demarcation of each type is only roughly stated. In connection with the map a preliminary description of the vegetation is given.

The west side of Jameson Land from the coast to about the 200 metre level is dominated by continuous dwarf scrub. Large areas with moist dwarf scrub, rich in mosses, are found in the valleys on the east coast of Jameson Land and in few areas on the west side. The eastern part is dominated by a sparse vegetation or areas without vegetation (snowbed, fell-field and bedrock). Marsh vegetation , ponds and lakes are concentrated in the westernmost part of Jameson Land and in the valley named Ørsted Dal in the northern part. The southern part has not been examined.

Examples of vegetation maps from selected areas are shown on p. 15-17.

Vegetation analyses have been made of the most important vegetation types in the areas examined, and 1100 collections of vascular plants have been brought to the Botanical Museum, Copenhagen, as documentation for the vegetation mapping.

A check-list of vascular plants has been made containing the collected species/taxa (Table 1), and the frequency of the species/taxa in the areas examined is stated by a five step scale 1: very rare, 2: rare, 3: sporadic occurrence, 4: common, 5: very common.

2) Investigations of the effects on vegetation and soil by driving All Terrain Vehicle (ATV) and All Terrain Cycle (ATC) is given in a separate report from Greenland Fisheries and Environmental Research Institute.

3) In connection with the seismic tests in 1982 botanical investigations took place. Sampling sites were examined before and after the surface shooting, and the damage to vegetation was registered. The following year the sites were revisited, and the vegetational recovery registered.

The extent of damage to vegetation depends mainly on the texture and the humus contents of the soil. The most severe effects of the surface shooting are seen in vegetation growing in a thin layer of soil with humus on stony ground. Vegetation on silty soil with a very thin humus layer appears to be most resistant to the surface shooting.

The species showed different sensitivity to the shooting. Arctic willow appears to be the least vulnerable of the dwarf shrubs. Grasses, sedges and herbs with a caespitose growth are managing much better than the other dwarf shrubs. In all sites the degree of cover has been substantially reduced.

4) Experiments with crude- and diesel oil spills on five vegetation types were carried out near Mestersvig. The preliminary investigations from this study indicate that only few individuals of arctic willow and sedges appeared to survive the crude oil treatment, whereas nearly all vegetation was killed by the diesel oil treatment.

# VEGETATIONSKORTLÆGNING

## 1. Indledning

I forbindelse med planer om olieefterforskning i Jameson Land, Nordøstgrønland, har Ministeriet for Grønland iværksat en række baggrundsundersøgelser af miljøet. I 1982-83 er foretaget en række botaniske undersøgelser, der forventes fortsat i 1984. Undersøgelserne udføres af Grønlands Botaniske Undersøgelser, Københavns Universitet, som konsulent for Grønlands Fiskeriundersøgelser. Den botaniske plan indeholder følgende punkter:

1) Fotoflyvning og fotoarbejde
2) Vegetationskortlægning ud fra falskfarvede flybilleder
3) Undersøgelser af seismiske undersøgelsers indvirkning på vegetation og jordbund
4) Undersøgelser af indvirkning på vegetation og jordbund ved kørsel med All Terrain Vehicle (ATV)
5) Undersøgelser af vegetationens følsomhed over for oliespild

Programmet blev udført i juli og august 1982, og resultaterne er publiceret i Fredskild, B., Bay, C. og Holt, S., 1982: Botaniske Undersøgelser på Jameson Land 1982, Botanisk Museum København.

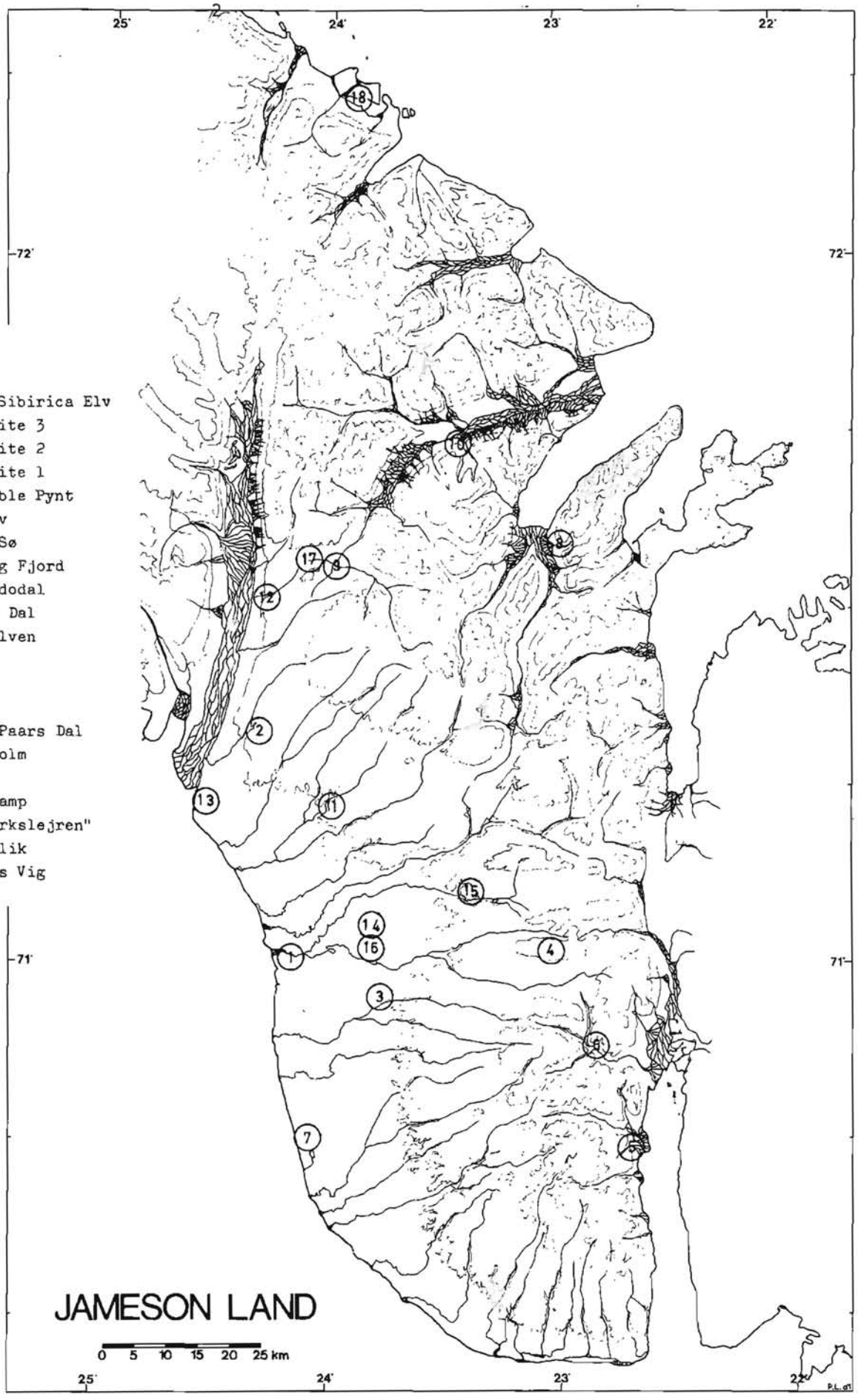
I feltsæsonen 1983 er der arbejdet videre med disse undersøgelser. Hovedvægten er lagt på felttolkning af IR flybilleder. Arbejdet blev udført af cand.scient. Christian Bay og cand.scieny. Sune Holt, som arbejdede sammen på to lokaliteter, hvorefter der blev arbejdet i to tomands hold den resterende del af sæsonen. Stud.scient. Ole Jørgensen og stud.scient. Birger Kruse assisterede ved dette arbejde. Udover kortlægning af vegetationstyperne blev de i 1982 påbegyndte botaniske undersøgelser videreført. De udvalgte prøveområder i forbindelse med de seismiske undersøgelser blev undersøgt, og skade på vegetation og jordbund blev registreret. Desuden blev kørsels- og oliespildsundersøgelserne fulgt op med undersøgelser i de pågældende områder.

## 2. Oversigt over tid og sted for feltarbejdet 1983

| | |
|---|---|
| 30.6. | Ankomst til Mesters Vig (SH) |
| 4.7. | Coloradodal (SH) |
| 6.7. | Ankomst til Mesters Vig (CB) |
| 6.-14.7. | Draba Sibirica Elv (CB & SH) |
| 14.-22.7. | Test site 3 (CB & SH) |
| 18.7. | Major Paars Dal (CB & SH) |
| 19.7. | Ankomst til Mesters Vig (OJ & BK) |
| 22.-30.7. | Test site 2 (CB & OJ), Test site 1 (SH & BK) |
| 30.7.-8.8. | Constable Pynt (CB & OJ), Ugleelv (SH & BK) |
| 8.-15.8. | Hugin Sø (CB & OJ), Fleming Fjord (SH & BK) |
| 15.-21.8. | Coloradodal (CB & OJ), Ørsted Dal (SH & BK) |
| 21.-28.8. | Olympelven (CB & OJ), Coloradodal (SH & BK) |
| 28.8.-3.9. | Mesters Vig (CB, OJ, SH & BK) |
| 4.9. | Hjemrejse |

På lokalitetskortet side 3 er vist de i 1982 og 1983 undersøgte lokaliteter.

## 2.1 Lokalitetskort




1983

1: Draba Sibirica Elv
2: Test site 3
3: Test site 2
4: Test site 1
5: Constable Pynt
6: Ugleelv
7: Hugin Sø
8: Fleming Fjord
9: Coloradodal
10: Ørsted Dal
11: Olympelven

1982

12: Major Paars Dal
13: Gurreholm
14: Heden
15: Base Camp
16: "Ødemarkslejren"
17: Uuppaalik
18: Mesters Vig

## 3. Vegetationskortlægning

Ved hjælp af falskfarvede infrarød flybilleder (28 x 28 cm) i målestokken 1 : ca. 25.000 er der foretaget felttolkning af billedmaterialet i 11 udvalgte områder. På hver lokalitet er der i gennemsnit arbejdet med vegetationskortlægning i 7 dage. Alt efter vegetationens kompleksitet er der karteret mellem 3 og 15 $km^2$ om dagen. De to hold har hver gået en strækning på ca. 500 km i løbet af feltsæsonen (se side 13).

Der er stor forskel på den vegetationsmæssige og floristiske sammensætning af lokaliteterne. Den største kompleksitet ses på de lokaliteter, hvor der er stor variation i topografiske og jordbundsmæssige forhold (se i øvrigt under vegetationsbeskrivelsen side 24).

Ud fra feltarbejdet i 1982 blev der lavet en klassifikation af vegetationstyper og impedimenter. Inddelingen blev modificeret i begyndelsen af feltsæsonen 1983. Der skelnes herefter mellem 14 vegetationstyper og 4 typer af områder uden vegetation (impedimenter) (se side 14).

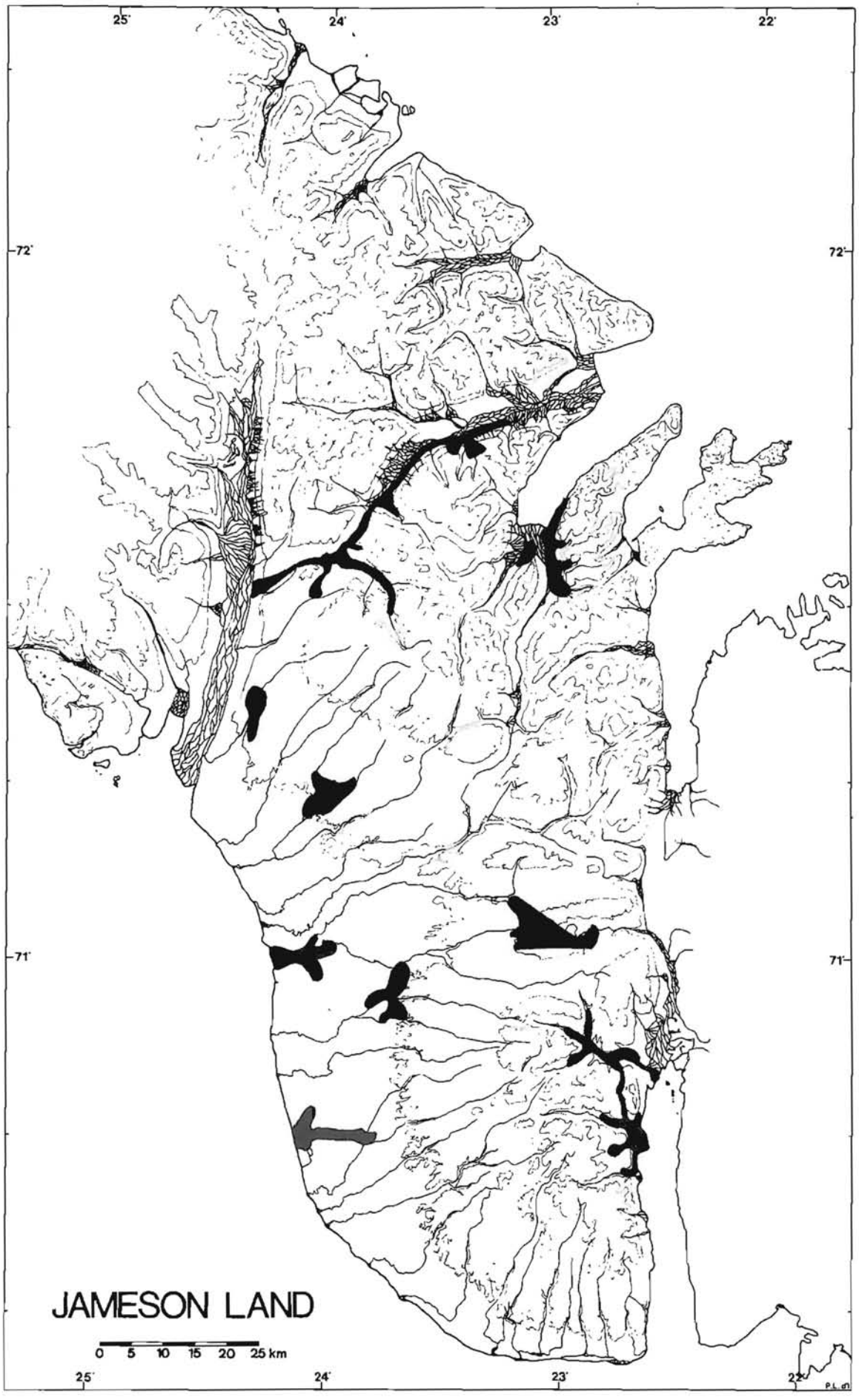
Opbygningen af vegetationsinddelingen følger Kamarkova, V. and Webber, P.J. 1980: The low arctic vegetation maps near Atkasook, Alaska. Arctic and Alpine Research Vol. 12, No. 4, 1980, pp 447-472. Således karakteriseres den enkelte type af en række arter, og typens topografiske forekomst er angivet. De enkelte vegetationstypers farve er valgt ud fra de principper, som angives af Küchler, A.W. 1967: Vegetation mapping, New York.

Ved inddelingen af hedetyperne anvendes dækningsgraden som det primære inddelingskriterium. Der skelnes mellem heder, som har en dækningsgrad større end 75%, mellem 75% og 25% og heder med en dækningsgrad under 25%.

Snelejerne er opdelt efter længden af den snefri periode. Udover de to klassiske typer: tidligt og sent snefrit sneleje, forekommer en type, som arealmæssig er vigtig i Jameson Land. Typen kan karakteriseres som en snelejepræget vegetation, hvor *Salix arctica* er den eneste forekommende dværgbusk, og denne art dominerer vegetationen. Vegetationen er dog åben, og dækningsgraden af *Salix arctica* udgør kun 6% i gennemsnit i de undersøgte områder. Typen forekommer typisk i lavninger, hvor snedækket er for længevarende til, at de øvrige dværgbuske kan etablere sig.

På side 15-17 gives eksempler på vegetationskort over udvalgte områder. Disse kort er udarbejdet i forbindelse med diskussionen om placering af ARCOs supply base. Endvidere gives detaljerede vegetationsbeskrivelser af disse områder.

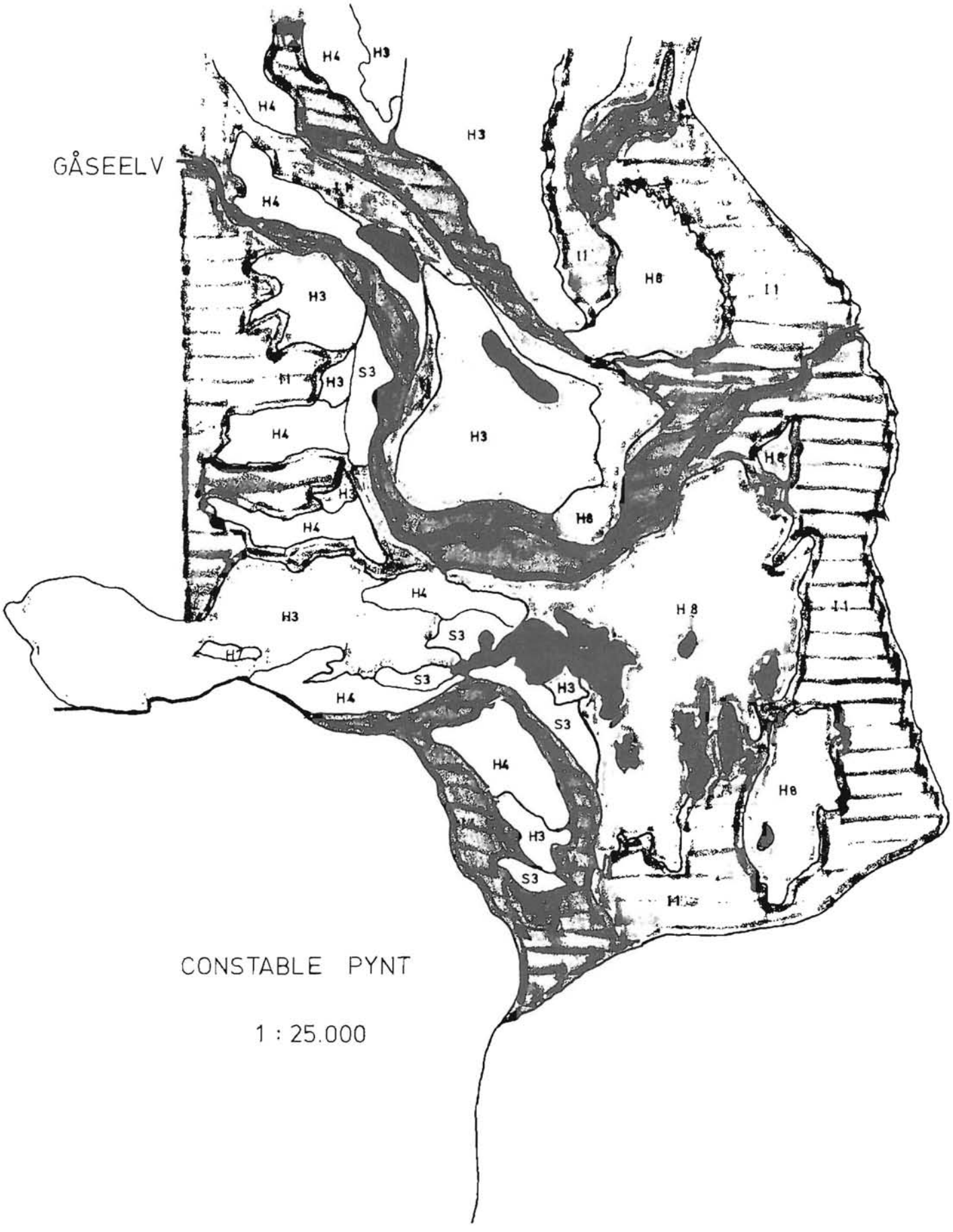
3.1 Aktivitetskort. De i 1983 undersøgte områder er angivet.



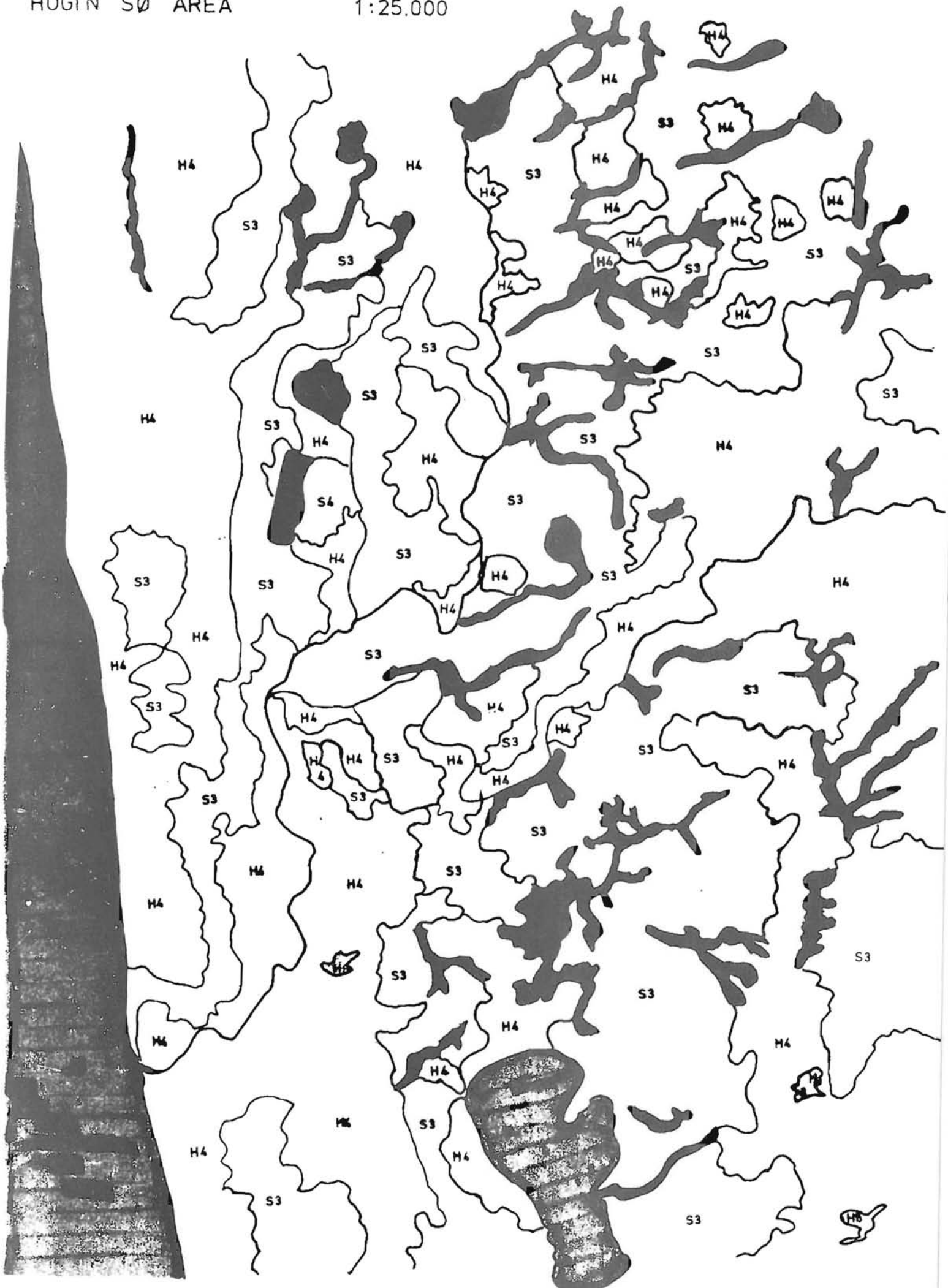
VEGETATION
JAMESON LAND, NE. GREENLAND.

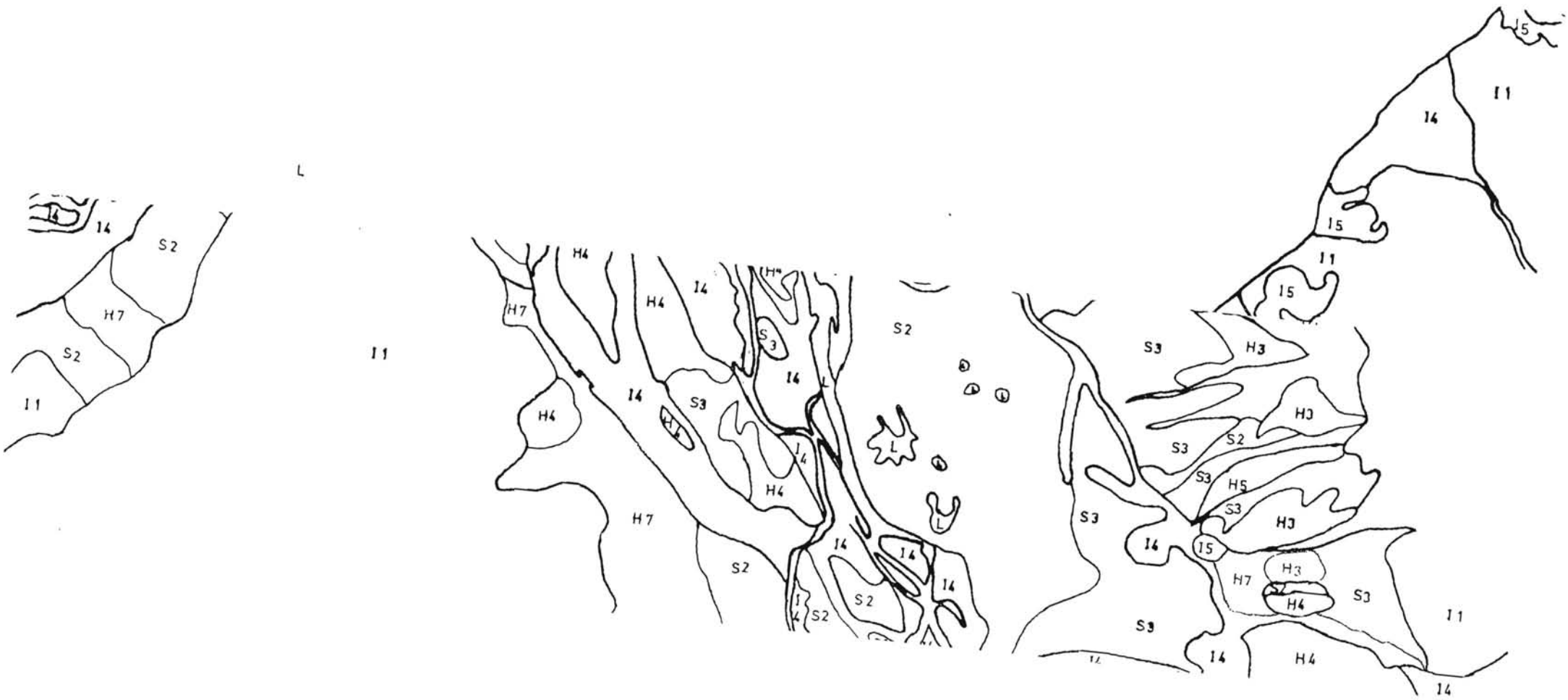
| CODE | IMPORTANT VASCULAR PLANT TAXA | VEGETATION UNIT | TERRAIN |
|---|---|---|---|
| M1 | Carex saxatilis, C. rariflora, Eriophorum scheuchzeri | Graminoid marsh and small ponds | Level ground along streams and lakes |
| M2 | Eriophorum triste, Ranunculus sulphureus, Arctagrostis latifolia | Hummocky meadow | Depressions in heaths and sloping ground |
| G1 | Calamagrostis neglecta, Poa pratensis, Arctagrostis latifolia | Wet grassland | Level ground along streams and lakes |
| G2 | Carex subspathacea, Puccinellia phryganodes, Stellaria humifusa | Salt marsh | Level ground along the coast |
| H2 | Taraxacum spp., Hieracium alpinum, Rhodiola rosea | Herb-slope | Moist south-facing sloping ground below snow drifts |
| H3 | Betula nana, Vaccinium uliginosum, Cassiope tetragona | Moist dwarf scrub, rich in mosses. Vegetation cover exceeding 75% | Level and sloping ground |
| H4 | Cassiope tetragona, Vaccinium ulioginosum, Betula nana | Dry dwarf scrub with vegetation cover between 25-75% | Level and sloping ground |
| H5 | Dryas octopetala, Betula nana, Vaccinium uliginosum | Sparse dwarf scrub | Level and sloping ground |
| H7 | Dryas octopetala, Arctostaphylos alpina, Salix arctica, Silene acaulis | Fell-field : sparse vegetation as a result of desiccation or solifluction | Wind-swept ridges or patterned ground |
| H8 | Dryas octopetala, Arctostaphylos alpina, Salix arctica | Sand dune with open to sparse vegetation | Wind swept ridges on sandy ground |
| T | Salix arctica, Potentilla crantzii | Thicket exceeding 20 centimeters in height | Moist, south-facing slopes |
| S1 | Salix arctica, S. herbacea, Sibbaldia procumbens, Carex scirpoidea | Snowbed : long growth period | Moist, south-facing slopes |
| S2 | Salix arctica, Luzula confusa, Carex lachenalii, Oxyria digyna | Snowbed : short growth period | Slopes with heavy snow cover |
| S3 | Salix arctica, Carex bigelowii, Polygonum viviparum, (Dryas octopetala) | Snowpatch : intermediary growth period | Shallow depressions on level or gently sloping ground |
| I1 | Bare ground, bedrock, stonefields and scree | | |
| I4 | Riverbeds | | |
| I5 | Snow and ice | | |
| L | Water | | |

3.3 Vegetationskort over udvalgte områder



HUGIN SØ AREA 1:25.000




I4
S2
H7
S2
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I4
I5
I1
I4
I5
I1
I5
S3
H3
H3
S3
S2
S3
H5
S3
H3
S3
I4
I5
H7
H3
H4
S3
S3
I1
I4
H4
I4

## 3.4 Vegetationsbeskrivelse af udvalgte områder

### The vegetation at Constable Pynt

Constable Pynt is an area of approximately six square kilometres, situated on the west side of Hurry Fjord. The area is a delta formation from Gåseelv and Primulaelv.

The vegetation is very complex in the area, and many different vegetation types are recorded. Dwarf scrub is the dominant vegetation type in the western part of Constable Pynt both south and north of Gåseelv. The dwarf scrub is either dominated by *Vaccinium uliginosum* and *Cassiope tetragona* or *Dryas octopetala* and *Salix arctica*.

South of Gåseelv, on the central part of Constable Pynt, there is a big area with many ponds and smaller lakes surrounded by marsh vegetation. The marsh is dominated by sedges (*Eriophorum scheuchzeri*, *Carex stans* and *Carex saxatilis* and grasses (*Calamagrostis neglecta*, *Arcagrostis latifolia* and *Alopecurus alpinus*), and they are rich in mosses. The total cover of mosses is 100%.

Large areas with continuous turfy dunes occur along the coast north and south of the mouth of Gåseelv. *Salis arctica* and *Dryas octopetala* are the dominant dwarf shrubs in this vegetation type. Accompanying species are *Polygonum viviparum*, *Potentilla pulchella*, *Taraxacum phymatocarpum* and *Armeria scabra*.

A salt marsh is seen in the eastern part of Constable Pynt. This type appears typically in the most southern and northern part with the usual species: *Carex subsparthacea*, *Carex ursina*, *Puccinellia phryganodes* and *Stellaria humifusa*.

Snow bed vegetation is only seen in few places in connection with herb slopes.

Big areas along the coast are completely without vegetation.

The vegetation near Hugin Sø

The vegetation is very homogeneous in a ten kilometre wide zone along the coast in the southwestern part of Jameson Land. Hugin Sø is situated in this area. Level ground with snow bed vegetation is predominating. Continuous dwarf scrub is less common in the area, and occurs only in the dry hills. The dwarf scrub is dominated by *Cassiope tetragona*.

The widely distributed snow bed vegetation is dominated by lichens, mosses and organic crust. The phanerogames have a maximum cover of 5%. Important species in this type are: *Salix arctica, Silene acaulis, Equisetum arvense* and the grasses *Poa pratensis* and *Trisetum spicatum*. Averagely, the organic crust constitues 80% of the cover and is built up of undifferentiated prothallus of lichens and mosses. This gives the landscape a grey colour. West of Hugin Sø the terrain is sloping westwards, and westbound valleys occur here. These are more moist than the surrounding hills.

The area is very rich in lakes and ponds, and marsh vegetation is mainly found, in connection with these forming a network of wet areas with continuous vegetation, rich in mosses.

Generally, the vegetation in the area bears the impress of a constant and prolonged snow-cover. It is so prolonged that the dwarf shrubs are only able to grow on the wind-exposed hills.

The vegetation at Fleming Fjord

Generally, snow melt occurs relatively late in the Fleming Fjord area. This leads to the wide extension of snow bed vegetation. Where snow melt occurs very late (late July to early August) a very sparse vegetation of *Salix herbacea*, *Salix arctica* and *Carex lachenalii* frequently occurs.

On places where snow melt takes place 3 or 4 weeks earlier, the vegetation is usually less sparse. It mostly consists of *Salix arctica*, *Dryas octopetala* and *Silene acaulis* as the most predominant species.

On the southfacing slopes, where the snow melts off early, and there is more or less constant water supply from snow melting at the higher altitudes, the vegetation is often dense and luxuriant. On these localities the early snow bed vegetation and herb slope vegetation occur. These types of vegetation have a very limited distribution in the Fleming Fjord area.

The area covered with snow bed vegetation constitutes 50-70% of the vegetated area.

Two kinds of dwarf scrub vegetation occur in the area. The most extended heath type is usually dominated by *Cassiope tetragona*, *Vaccinium uliginosum* and *Betula nana*. This vegetation type has a cover between 25-75% and constitutes between 10-20% of the vegetated areas.

A more luxuriant heath type with a cover between 75-100% occurs only sporadically. This type is usually dominated by the same species as the former heath type, but has in addition a well developed moss layer.

Where the rivers from the side valleys enter Pingel Dal and Fleming Fjord large stony deltas are usually formed. These stony deltas are mostly unvegetated. However, on silt bars in the deltas dwarf scrub and snow bed vegetation frequently occur.

Large areas with salt marsh vegetation occur in the large delta where Pingel Dal and Enhjørningen Dal meet in Fleming Fjord. This vegetation is dominated by *Carex subspathacea* and is important fouraging for geese.

Marsh vegetation has a very limited distribution in the Fleming Fjord area.

## 4. Vegetationsanalyser

På hver af de undersøgte lokaliteter er der lavet vegetationsanalyser i de arealmæssig vigtige vegetationstyper, således at der foreligger detaljerede oplysninger om de vegetationstyper, som danner grundlag for hele vegetationskortlægningsarbejdet.

Langs en linie i hver type er udlagt 15 rektangler à 1/3 $m^2$ (100 x 33,3 cm), og dækningsgraden af de enkelte arter af fanerogamer er anslået. Er dækningsgraden under 1% angives artens tilstedeværelse i feltet med et kryds (+). Desuden angives dækningsgraden for kategorierne mosser, lichener, organic crust og bar jord og sten. Herunder er de vigtigste mos- og lichenslægter vurderet for sig. Det gælder slægterne *Polytrichum*, *Stereocaulon*, *Peltigera*, *Cetraria*, *Thamnolia*, *Cladina* og *Solorina*. På side 22-33 er vist et eksempel på en sådan analyse. Da dækningsgraden af kategorierne fanerogamer og kryptogamer er vurderet hver for sig, kan det totale plantedække godt overstige 100%.

Følgende typer er analyseret på nedenstående lokaliteter:

| | |
|---|---|
| Draba Sibirica Elv | : H2, H3 (3 stk.), S1, S3 (2 stk.), G2, M1 |
| Test site 3 | : S3, M2 (2 stk.) |
| Test site 2 | : H3, H4 (2 stk.), S2 (2 stk.), S3 |
| Test site 1 | : H4 (2 stk.), H7 |
| Constable Pynt | : H2, H4 (2 stk.), H8, G1, G2 |
| Ugleelv | : H3, H8, G1, G2 |
| Hugin Sø | : H4, S3 (2 stk.), M1 |
| Fleming Fjord | : H7, S3, M2, G2 |
| Coloradodal | : H4, S3 (2 stk.), G1 (2 stk.) |
| Ørsted Dal | : H8, M1 (3 stk.), M2 |
| Olympelven | : H4 (2 stk.), H5 (2 stk.) |

# VEGETATIONSKARTERING

22
DATO: 25/7 1983 LØBE NR.: CB 1

| KODE | HOVEDTYPE | UNDERTYPE | VEGETATIONSTYPE |
|---|---|---|---|
| H3 | Dværgbuskhede | frodig, mosrig | |

ARTER OG DÆKNING: ANTAL OBS.

| DVÆRGBUSKVEG. | % | URTEVEG. | % | MOS/LAV-VEG. | % |
|---|---|---|---|---|---|
| *Salix arctica* | 15,3 | *Equisetum arvense* | + | *Peltigera sp.* | 1,8 |
| *Vaccinium uliginosum* | 2,9 | *Draba glabella* | + | *Stereocaulon sp.* | + |
| *Cassiope tetragona* | 5,5 | *Cerastium arvense* | + | Øvrige lichener | + |
| *Betula nana* | 7,3 | *Polygonum viviparum* | + | Mosser | 76,0 |
| *Dryas octopetala* | + | *Saxifraga cernua* | + | | |
| | | *Ranunculus pygmaeus* | + | | |
| | | *Stellaria edwardsii* | + | | |
| | | *Pyrola grandiflora* | + | | |
| | | Graminoider: | | | |
| | | *Poa pratensis* | + | | |
| | | *Arctagrostis latifolia* | + | | |
| | | *Luzula confusa* | + | | |
| TOTAL DVÆRGBUSK % → | 31,0 | TOTAL URTEVEG. % → | + | TOTAL MOS/LAV-VEG. % → | 77,8 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| EKSPONERING → | S | SW | W | NW | N | NE | E | SE | Σ TOTALT PLANTEDÆKKE 108,8 % |
| HÆLDNING → | 0-5° | | 5-10° | | 10-20° | | 20-40° | >40° | |
| VEG. HØJDE cm. → | 10 | | pH 0-2cm. 5,3 / 10cm. 5,3 | | | | | | ALT. 190 m |
| FUGTIGHED → | VÅD | | FUGTIG x | | TØR | | EXT. TØR | | UDTØRRET |
| TOPOGRAFISK FORH. → | TOP | | ØVERST | | NEDERST | | SÆNKNING | | FLADT x |
| JORDBUND TEXTUR → | GRUS | | SAND x | | SILT | | HUMUS → | | DYBDE 8 cm |
| GEOGRAFISK LOK. → | Test site 2, Lollandselv 70 ° 57 'N., 23 ° 43 W. | | | | | | | | |

ANDRE FORHOLD:

DÆKKES AF FLYFOT. No. 27-930

ILL. FILM No.: CB 4 EXP. No.: 35

INDS. PRØVE Nos pH nr. 1 + 2

PLANTE BELÆG No. -No.

S.H-81

VEGETATIONSKARTERING 23

HJÆLPESKEMA DATO: 25/7 1983 LØBE No. 1

| ARTER: | ANALYSE No. 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | % | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Salix arctica* | 35 | 35 | 40 | 60 | 10 | 10 | 5 | 12 | 2 | 2 | 2 | | 7 | 8 | 1 | 15,3 | |
| *Vaccinium uligonosum* | 10 | | | | | 10 | 2 | 1 | | 3 | | | 7 | 3 | 7 | 2,9 | |
| *Poa pratensis* | + | + | + | 1 | 5 | + | + | + | + | + | + | + | + | + | + | + | |
| *Equisetum arvense* | 1 | 1 | + | 1 | 1 | + | 1 | 1 | 1 | 1 | 2 | 1 | + | + | + | + | |
| *Cassiope tetragona* | 1 | 10 | | | | 7 | 5 | 10 | 15 | | 5 | | 10 | 10 | 10 | 5,5 | |
| *Draba glabella* | + | + | + | | + | | | | | | | | | | | + | |
| *Cerastium arcticum* | + | + | | | | | | | | | | | | | | + | |
| *Polygonum viviparum* | | + | + | + | 1 | | | | + | | | | | | | + | |
| *Saxifraga cernua* | | | + | | | | | | | | | | | | | + | |
| *Arctagrostis latifolia* | | | + | | | | | | + | + | 1 | 2 | 1 | | | + | |
| *Ranunculus pygmaeus* | | | | | + | | | | | | | | | | | + | |
| *Stellaria edwardsii* | | | | | + | | + | | | + | | + | + | | | + | |
| *Betula nana* | | | | | | 3 | | 5 | 7 | 35 | 10 | 12 | 3 | 5 | 30 | 7,3 | |
| *Pyrola grandiflora* | | | | | | | 3 | 1 | | 2 | 2 | | | | | + | |
| *Dryas octopetala* | | | | | | | | | 2 | | | | | | | + | |
| *Luzula confusa* | | | | | | | | | | + | | | | | | + | |
| *Peltigera sp.* | + | 3 | 2 | 2 | 3 | 4 | + | 1 | + | + | 2 | 3 | 3 | 3 | 1 | 1,8 | |
| *Stereocaulon sp.* | | | | | 8 | | | | + | + | | | + | + | + | + | |
| Laver | | | | | + | + | + | + | + | + | + | + | + | + | 1 | + | |
| Mosser | 30 | 95 | 100 | 100 | 90 | 25 | 30 | 30 | 75 | 95 | 90 | 100 | 95 | 75 | 80 | 76,0 | |
| Bar jord | 30 | + | | | | 25 | 5 | 5 | 5 | | | | | | | 4,7 | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

## 5. Foreløbig vegetationsbeskrivelse af Jameson Land

Vegetationsbeskrivelsen er baseret på feltobservationer i 1982 og 1983. I løbet af de to feltsæsoner er 18 forskellige lokaliteter besøgt, og flora- og vegetationsundersøgelser er foretaget. Opholdenes varighed på den enkelte lokalitet varierer fra eet til ti døgn. Dog har de fleste ophold haft en varighed på en uge. På lokaliteter, hvor varigheden af opholdet var tilstrækkelig til at få et overblik over vegetationstypernes udbredelse og floristiske sammensætning, er der udarbejdet en detaljeret vegetationsbeskrivelse og en liste over de forekommende arter med angivelse af deres hyppighed. Hyppigheden af fanerogamerne er vurderet efter en 5 trins skala 1: meget sjælden, 1-2 fund; 2: sjælden, 3-5 fund; 3: hist og her, sporadisk forekomst, men arten er set næsten dagligt; 4: almindelig; 5: meget almindelig. En samlet floristisk liste over samtlige lokaliteter findes på side 29-34.

I vegetationsbeskrivelserne fra de enkelte lokaliteter nævnes for hver vegetationstype dens arealmæssige udbredelse, hyppighed og artssammensætning samt typens forekomst i forhold til topografiske og jordbundsmæssige forhold.

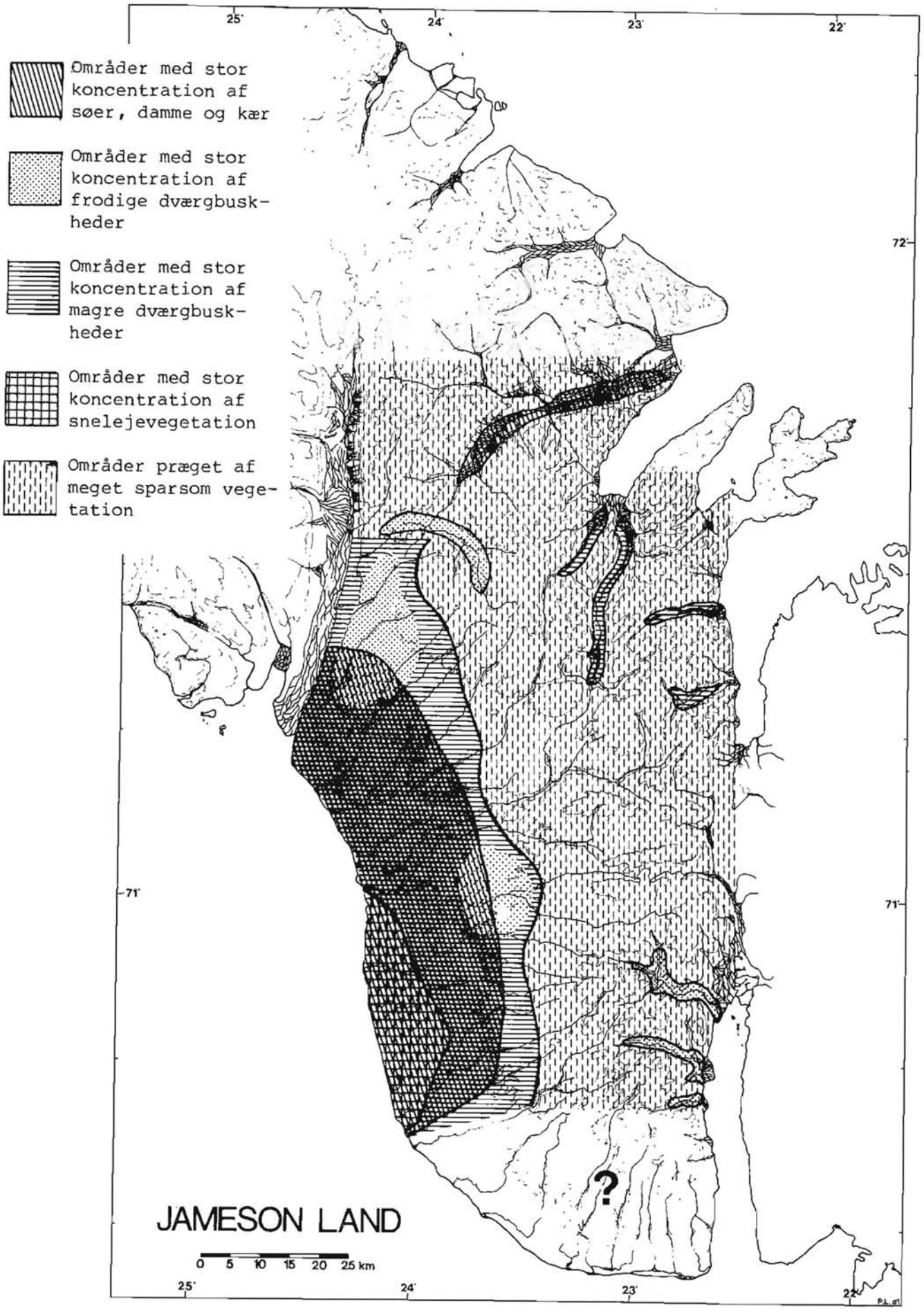
Ud fra disse vegetationsbeskrivelser og ud fra en summarisk gennemgang af IR-billedmaterialet er der her udarbejdet en foreløbig vegetationsbeskrivelse og et foreløbigt vegetationskort. Det skal pointeres, at især områderne midt på Jameson Land over 300 meterniveauet langt fra er undersøgt tilstrækkeligt. Det samme gælder den sydligste del af Jameson Land, syd for en linie fra Hugin Sø til Constable Pynt.

På det foreløbige vegetationskort er kun medtaget de vegetationstyper, som er arealmæssig dominerende, eller som udgør vigtige tilholds- eller fourageringsområder for gæs og moskusokser. Afgrænsningen af de enkelte typer er kun angivet i grove træk (se side 25).

I det følgende gives en foreløbig oversigt over vegetationen i Jameson Land. Vedrørende definition og artssammensætning af de enkelte typer henvises til vegetationsklassifikationen side 14.

Vestsiden af Jameson Land fra kysten til ca. 200 meterniveauet i det indre af Jameson Land domineres af sammenhængende dværgbuskhede. Den hyppigste hedetype er "medium"-heden (H4) med en dækningsgrad af fanerogamer på 25-75%. På beskyttede syd- og nordeksponerede skråninger langs de store østvestgående elve findes den mest frodige af hedetyperne.

## 5.1 Foreløbigt vegetationskort



Denne frodige, mosrige hedetype (H3) udgør i 2 områder den mest dominerende af hedetyperne. Der er her tale dels om området omkring det indre af Draba Sibirica Elv øst for Tyskit nunât, og dels området øst for Regneelv ved Lodins Elv.

Ud mod Hurry Fjord forekommer der i enkelte områder sammenhængende hede, men denne vegetationstype er arealmæssig mindre væsentlig. På østsiden af Schuckert Dal breder heden sig østover til et niveau på 400-500 meter.

Den ensartede hede brydes i de kystnære områder af sammenhængende områder med en snelejepræget vegetation. Denne vegetationstype er den mest fremtrædende type i et ti kilometer bredt bælte langs kysten fra Jyllandselv og mod nord til Tyskit nunât.

Øst for området med sammenhængende hedevegetation afløses vegetationen af åben dværgbuskhede og sene snelejer, som går over i en helt åben fjeldmarksvegetation. I det centrale Jameson Land over ca. 500 meterniveauet findes store sammenhængende områder, som er vegetationsløse.

De østgående dale på vestsiden af Hurry Fjord er meget frodige. På de sydeksponerede skråninger ses en kompleks vegetationsmosaik af frodig hede, krat, urteli og græslandsvegetation. En lignende frodig vegetation ses pletvis på de sydeksponerede skråninger ved de store elve på vestsiden af Jameson Land.

Den største koncentration af søer og damme findes på vestsiden af Jameson Land mellem området syd for Hugin Sø og Gurreholm. I forbindelse med disse og i lavninger i området findes mange kær.

Egentlige strandenge forekommer i forbindelse med deltaer fra store elve. Således er der fundet større strandenge ved Tyskit nunât på vestsiden af Jameson Land og ved Constable Pynt og Ugleelvs udløb i Hurry Fjord. Fragmentariske strandenge optræder flere steder langs kysten, men ofte udgør de kun få kvadratmeter.

## 6. Planteindsamlinger og floristiske bemærkninger

I 1982 blev der i forbindelse med vegetationsundersøgelserne foretaget omfattende planteindsamlinger i de undersøgte områder. På Botanisk Museum i København forelå der kun sparsomme oplysninger om Jameson Lands flora. De fleste kollektioner stammer fra yderkystområderne, så det skønnedes vigtigt at foretage systematiske indsamlinger af fanerogamer på alle de besøgte lo-

kaliteter. I løbet af feltsæsonen 1982 blev der i alt indsamlet 1630 numre fordelt på 185 arter/taxa i Jameson Land og Mesters Vig området. Desuden blev materiale af kritiske taxa, som er vanskelige at bestemme i felten, hjembragt til nøjere undersøgelse.

Dette floristiske arbejde blev fulgt op i feltsæsonen 1983. På samtlige besøgte lokaliteter er materiale af alle registrerede taxa indsamlet og hjembragt til Botanisk Museums Grønlandsherbarium. Dog er der kun indsamlet supplerende materiale på de lokaliteter, som også blev besøgt i 1982.

I nedenstående tabel er opført alle de observerede eller indsamlede taxa fra feltsæsonen 1983 (få af oplysningerne stammer dog fra feltarbejdet 1982).

For hver af de 11 undersøgte lokaliteter er angivet en hyppighed af de forekommende taxa. Hyppigheden vurderes efter en 5 trins skala 1: meget sjælden, 1-2 fund; 2: sjælden, 3-5 fund; 3: hist og her, sporadisk forekomst (arten er set næsten daglig); 4: almindelig; 5: meget almindelig. Flere af de systematisk komplekse taxa er behandlet under ét. Dette gælder følgende: *Poa arctica* og *P. pratensis*, *Carex boecheriana* og *C. capillaris*, *Draba arctica* og *D. groenlandica* og *Taraxacum brachyceras* og *T. croseum*.

For få af kollektionerne gælder, at det indsamlede materiale er for dårligt til, at man med sikkerhed kan bestemme disse kollektioner. I tabellen er disse efterfulgt af et udråbstegn.

Flere af de i 1982 undersøgte lokaliteter er besøgt igen i 1983. En del arter er kommet til floralisten fra 1982, og disse fund er indført i tabellen. På de lokaliteter, hvor en hyppighedsangivelse ikke er foretaget i 1982, er en sådan udarbejdet.

Gennem feltarbejdet er kendskabet til arternes udbredelse udviddet for enkelte arters vedkommende. Fundene af *Phleum commutatum* har betydet, at arten nu kendes fra 2 lokaliteter, som ligger ca. 300 km nord for den hidtidige nordgrænse på Kap Ravn. *Alchemilla glomerulans*, *Epilobium anagallidifolium* og *Loiseleuria procumbens* har også fået rykket deres nordgrænse, og *Roegneria hyperarctica* har fået rykket sin sydgrænse. *Ranunculus affinis* har fået udviddet sin udbredelse til også at omfatte floradistriktet $CE_n$ (central øst, nord). *Ranunculus auricomus* er hidtidig kun kendt fra 3 lokaliteter i Østgrønland, hertil kan føjes 2 lokaliteter i Jameson Land.

I alt er der indsamlet 1100 kollektioner fordelt på 186 taxa, og artsantallet på de enkelte lokaliteter varierer meget - ekstremerne ligger på

104 og 161 arter. Forskellen i artsantallet skyldes forskelle i klimatiske, topografiske og edafiske forhold. Den største artsdiversitet er konstateret i området ved Constable Pynt. Her er der store topografiske forskelle, og forekomsten af en række arter, som betegnes næringskrævende, vidner om jordarter med højt næringsindhold. Disse er ellers sjældne i de områder i Jameson Land, som hidtidig er undersøgt. 12 af de fundne arter betegnes som næringskrævende, disse er: *Carex atrofusca, C. bicolor, C. marina spp pseudolagopina, C. maritima, C. microglochin, Colpodium vahlianum, Eriophorum callitrix, Eutrema edwardsii, Juncus triglumis, Kobresia simplisciuscula, Saxifraga nathorstii* og *Tofieldia coccinea*.

En eller flere af disse arter er fundet på 7 af de besøgte lokaliteter. På 5 af disse er der fundet mindst 5 af arterne, og ofte drejer det sig om flere fund af samme art. Disse lokaliteter karakteriseres således blandt andet ved, at der lokalt forekommer områder, hvor næringskrævende arter kan klare sig. Det er især i områder, hvor de triassiske sedimenter indgår i det øverste jordlag, at de næringskrævende arter er fundet.

## 6.1 Hyppighedsliste

(Tabel 1)

| | Draba Sibirica Elv | Test site 3 | Test site 2 | Test site 1 | Constable Pynt | Ugleelv | Hugin Sø | Fleming Fjord | Coloradodal | Ørsted Dal | Olympelven |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Agrostis mertensii* | 2 | 1 | 3 | | | | 1 | | | | 3 |
| *Alchemilla glomerulans* | | | 1 | | 1 | 1 | | | | | |
| *Alopecurus alpinus* | 2 | 1 | | 5 | 4 | 4 | | | | 4 | |
| *Antennaria canescens* | 3 | 3 | 3 | 2 | 4 | 3 | 3 | 3 | 3 | 2 | 3 |
| - *porsildii* | 3 | 3 | 4 | 1 | 3 | 2 | 3 | 2 | 2 | 2 | 2 |
| *Arabis alpina* | | 1 | 3 | 3 | 3 | 3 | | 3 | 3 | 3 | |
| *Arctagrostis latifolia* | 3 | 4 | 4 | 5 | 4 | 4 | 2 | 2 | 4 | 4 | 3 |
| *Arctostaphylos alpina* | 3 | 3 | 4 | 2 | 4 | 4 | 3 | 4 | 2 | 4 | 3 |
| *Arenaria humifusa* | | | 3 | 1 | | 1 | | | | | 2 |
| - *pseudofrigida* | | 1 | 2 | 2 | 2 | 3 | | 2 | 1 | | 2 |
| *Armeria scabra* | 3 | 1 | 4 | 3 | 4 | 3 | 2 | | 3 | 3 | 3 |
| *Arnica angustifolia* | 3 | 3 | 4 | 3 | 4 | 3 | 2 | 3 | 3 | 3 | 2 |
| *Betula nana* | 4 | 5 | 5 | 4 | 5 | 5 | 3 | 5 | 4 | 5 | 5 |
| *Botrychium lunaria* | | | 1 | | 1 | 2 | | 2 | | 1 | |
| *Braya purpurescens* | | | 1 | 1 | 2 | 2 | | | 1 | 2 | |
| *Calamagrostis neglecta* | 4 | 3 | 4 | | 4 | 3 | 4 | 2 | 4 | 4 | 3 |
| - *purpurescens* | | 2 | 1 | 2 | 2 | 3 | | | 2 | 2 | 2 |
| *Callitriche palustris* | 3 | | 2 | | | | 2 | | | | |
| *Campanula gieseckiana* | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 |
| - *uniflora* | | | | 2 | 2 | 2 | | | 2 | | |
| *Cardamine bellidifolia* | 1 | 4 | 2 | 2 | | | 2 | | 1 | 2 | 2 |
| - *pratensis* | 2 | | 1 | | 1 | 2 | 3 | 1 | 2 | 1 | |
| *Carex atrofusca* | | | | | 3 | 2 | | 1 | 2 | 1 | |
| - *bicolor* | | | 2 | | 2 | 2 | | | 1 | | 2 |
| - *bigelowii* | 5 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 4 |
| - *boecheriana/capillaris* | 1 | 2 | 1 | 2 | 4 | 3 | | 2 | 3 | 3 | 3 |
| - *glacialis* | | | 4 | 2 | 3 | | 1 | | 1 | | 3 |
| - *glareosa* | 1 | | | | 1 | | | | | | |
| - *lachenalii* | 5 | 5 | 5 | 5 | 5 | 3 | 5 | 4 | 4 | 4 | 4 |
| - *macloviana* | | 1 | 1 | | 2 | 2 | | | 1 | | |
| - *marina ssp. pseudolagopina* | | | | | 1 | 1 | | | | 1 | |

| | Draba Sibirica Elv | Test site 3 | Test site 2 | Test site 1 | Constable Pynt | Ugleelv | Hugin Sø | Fleming Fjord | Coloradodal | Ørsted Dal | Olympelven |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Carex maritima* | | | | | 2 | 3 | | | 1 | | 1 |
| - *microglochin* | | | | | 1 | | | | | | 1 |
| - *misandra* | 2 | 2 | 3 | 5 | 3 | 4 | | 3 | 3 | 3 | 3 |
| - *nardina* | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| - *norvegica* | | 1 | | | 1 | | | | 1 | 1 | |
| - *parallela* | 1 | | 1 | 1 | 2 | 2 | | 2 | | 2 | 2 |
| - - *x lachenalii* | | | 1 | | 1 | | | | | | |
| - *rariflora* | 5 | 3 | 4 | 2 | 2 | 4 | 3 | | 1 | 2 | 3 |
| - *rufina* | | | | | | | 3 | | | | |
| - *rupestris* | 3 | 3 | 4 | 4 | 3 | 3 | 1 | 4 | 3 | 5 | 4 |
| - *saxatilis* | 3 | 5 | 5 | 3 | 4 | 4 | 2 | 2 | 3 | 3 | 3 |
| - *scirpoidea* | 3 | 1 | 5 | 3 | 4 | 3 | 2 | 4 | 2 | 3 | 4 |
| - *stans* | 2 | | 1 | | 1 | | 2 | | 2 | | |
| - *subsparthacea* | 4 | | | | 2 | 1 | 2 | 2 | 1 | 2 | |
| - *supina* | | 2 | 1 | | 1 | | | | | 1 | 2 |
| - *ursina* | | | | | 2 | | | | | | |
| *Cassiope tetragona* | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| *Cerastium arcticum* | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| - *cerastoides* | 2 | 2 | 2 | | 3 | 2 | 4 | 1 | 2 | 2 | 1 |
| - *regelii* | | | | | 1 | | | 1 | | | |
| *Chamaenerion latifolium* | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| *Cochlearia groenlandica* | 1 | | 1 | 1 | 2 | 2 | 2 | | | 1 | |
| *Colpodium vahlianum* | | | | | 2 | 2 | | 1 | | | |
| *Cystopteris fragilis* | 1 | | 2 | 1 | | | | 2 | 1 | 1 | |
| *Diapensia lapponica* | 1 | | 2 | | | | 2 | | | | 3 |
| *Diphasiastrum alpinum* | | | 1 | | | | 1 | | | | |
| *Draba alpina* | 3 | 2 | 3 | 4 | 2 | 3 | 4 | 4 | 4 | 4 | 2 |
| - *arctica/groenlandica* | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 2 |
| - *bellii* | | | 1 | 1 | | | | | 1 | | |
| - *cinerea* | | | | | | | | 1 | | 1 | |
| - *crassifolia* | | 2 | 1 | | 1 | 2 | 1 | 2 | 1 | 1 | |
| - *fladnizensis* | | 1 | | | 1 | 1 | | 1 | 1 | 1 | |

| | Draba Sibirica Elv | Test site 3 | Test site 2 | Test site 1 | Constable Pynt | Ugleelv | Hugin Sø | Fleming Fjord | Coloradodal | Ørsted Dal | Olympelven |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Draba glabella* | 3 | 4 | 3 | 3 | 3 | 4 | 2 | 3 | 4 | 3 | 1 |
| - *gredinii* | | | | 1! | | | | 1! | | 1 | |
| - *lactea* | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 4 | 3 | 3 |
| - *nivalis* | 2 | 2 | 2 | 1 | 1 | 2 | 3 | 1 | 1 | | 2 |
| - *sibirica* | 4 | | 1 | 3 | 4 | 3 | | | | | |
| - *subcapitata* | | | | | 2 | 2 | | 1 | | | |
| *Dryas octopetala* | 3 | 3 | 5 | 5 | 5 | 5 | 2 | 5 | 4 | 5 | 4 |
| *Elymus hyperarctica* | | | | | 1 | 2 | | | | | |
| *Empetrum hermaphroditum* | 4 | 3 | 5 | 2 | 5 | 4 | 4 | 3 | 2 | 4 | 4 |
| *Epilobium anagallidifolium* | | | 1 | 1 | 1 | 1 | | | 1 | 1 | |
| *Equisetum arvense* | 4 | 4 | 5 | 4 | 5 | 5 | 5 | 3 | 5 | 5 | 3 |
| - *variegatum* | 2 | 1 | 4 | 3 | 5 | 3 | 2 | 4 | 3 | 5 | 2 |
| *Erigeron compositus* | | | | | 1 | 1 | | 1 | | | |
| - *eriocephalus* | | 1 | | | | | | 1 | 1 | 2 | 1 |
| - *humilis* | 3 | 4 | 4 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 |
| *Eriophorum callitrix* | | | | | 2 | 3 | | | | 1 | 1 |
| - *scheuchzeri* | 4 | 4 | 4 | 3 | 4 | 4 | 4 | | 4 | 3 | 4 |
| - *triste* | 3 | 4 | 4 | 5 | 4 | 4 | 2 | 3 | 4 | 5 | 4 |
| *Euphrasia frigida* | 1 | 1 | 2 | | 4 | 4 | | 2 | 2 | | 2 |
| *Eutrema edwardsii* | | | | | 1 | | | | 1 | 2 | |
| *Festuca baffinensis* | | 1 | | | 1 | 1 | | | | 1 | |
| - *brachyphylla* | 3 | 3 | 2 | 2 | 3 | 4 | 3 | 3 | 3 | 3 | 2 |
| - *rubra* | 3 | 3 | 2 | | 4 | 3 | 4 | 2 | 3 | 3 | 3 |
| - *vivipara* | | | | 1 | 3 | 2 | | 1 | 3 | 2 | 1 |
| *Gentiana nivalis* | | 1 | 2 | | 3 | 1 | | 2 | 1 | 1 | 2 |
| - *tenella* | | | | | 3 | 2 | | 2 | 1 | 2 | |
| *Gnaphalium supinum* | 1! | | 1 | | 1 | 1 | 1! | | | | |
| *Harrimanella hypnoides* | 4 | 2 | 3 | | 1 | | 4 | 2 | | | 3 |
| *Hieracium alpinum* | 2 | 1 | 3 | 1 | 3 | 2 | | 1 | 1 | 1 | 2 |
| *Hierochloë alpina* | 3 | 3 | 3 | 3 | 1 | 3 | 3 | | 3 | 1 | 3 |
| *Hippuris vulgaris* | 4 | 3 | 2 | | 2 | 1 | 3 | | 2 | | 2 |
| *Huperzia selago* | 3 | 1 | 3 | 3 | | | 3 | 2 | 2 | | 3 |
| *Juncus arcticus* | 3 | 1 | 3 | 1 | 4 | 4 | | | 3 | 4 | 4 |
| - *biglumis* | 3 | 4 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 4 | 3 |

| | Draba Sibirica Elv | Test site 3 | Test site 2 | Test site 1 | Constable Pynt | Ugleelv | Hugin Sø | Fleming Fjord | Coloradodal | Ørsted Dal | Olympelven |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Juncus castaneus* | | 1 | 2 | 2 | 3 | 3 | | 1 | 3 | 3 | 2 |
| - *trifidus* | | 1 | 3 | | 1 | 1 | 2 | | 1 | 1 | 2 |
| - *triglumis* | | | | 2 | 2 | 3 | | | 1 | 3 | 3 |
| *Kobresia myosuroides* | 1 | 2 | 1 | 2 | 5 | 5 | | 4 | 3 | 4 | 2 |
| - *simplisiuscula* | | | | | 2 | 1 | | | | | 1 |
| *Koenigia islandica* | 4 | 3 | 2 | 2 | 2 | 2 | 4 | 3 | 2 | 3 | 2 |
| *Lesquerella arctica* | | | 1 | 2 | 1 | 2 | | | 2 | 3 | 1 |
| *Loiseleuria procumbens* | | | | | | | 1 | | | | |
| *Luzula arctica* | 3 | 2 | 2 | 3 | 3 | | 2 | 3 | 3 | 1 | 3 |
| - *confusa* | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 3 | 4 | 4 | 4 |
| - *frigida* | 3 | 3 | 4 | 2 | 3 | 3 | 4 | | 3 | 2 | 3 |
| - *spicata* | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 3 |
| *Lycopodium annotinum* | 3 | | 3 | 1 | 1 | | 2 | | | | 1 |
| *Melandrium affine* | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | | | |
| - *apetalum* | | 1 | | 2 | 3 | 2 | | 1 | 3 | 3 | 1 |
| - *triflorum* | 3 | | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 |
| *Minuartia biflora* | 3 | 5 | 5 | 4 | 3 | 3 | 4 | 3 | 4 | 3 | 3 |
| - *rubella* | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | | 1 | 2 |
| - *stricta* | 2 | 1 | 2 | 1 | 3 | 2 | | 1 | 3 | 3 | 3 |
| *Oxyria digyna* | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 |
| *Papaver radicatum* | 1 | 3 | 1 | 3 | 3 | 4 | | 3 | 3 | 3 | 2 |
| *Pedicularis flammea* | | 1 | 2 | 1 | 3 | 3 | | | 2 | 3 | 2 |
| - *hirsuta* | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 3 |
| - *lapponica* | 4 | 4 | 4 | 2 | 3 | 3 | 2 | | 2 | 2 | 2 |
| *Phippsia algida* | 3 | 2 | 1 | 2 | 2 | 2 | 3 | | 2 | 2 | 2 |
| *Phleum commutatum* | | | 1 | | 1 | | | | | | |
| *Phyllodoce coerulea* | 4 | | 4 | | 1 | | 4 | | | | 3 |
| *Pinguicula vulgaris* | | | | | | 1 | | | | | |
| *Pleuropogon sabinei* | | | | | | | | | | 1 | |
| *Poa alpina* | | 2 | 3 | 3 | 3 | 3 | | 4 | 3 | 3 | 2 |
| - *alpina var. vivipara* | 1 | 1 | 3 | 3 | 3 | 3 | 4 | 3 | | 1 | |
| - *arctica/pratensis* | 3 | 5 | 4 | 4 | 4 | 5 | 4 | 3 | 4 | 5 | 3 |
| - *glauca* | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| | Draba Sibirica Elv | Test site 3 | Test site 2 | Test site 1 | Constable Pynt | Ugleelv | Hugin Sø | Fleming Fjord | Coloradodal | Ørsted Dal | Olympelven |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Poa hartzii* | | | | | 2 | 1 | | | 1 | | |
| *- pratensis var. colpodea* | | | | | 1 | | | | | 1 | |
| *Polygonum viviparum* | 4 | 5 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 3 |
| *Potentilla crantzii* | 3 | 4 | 4 | 2 | 3 | 4 | 4 | 3 | 3 | 4 | 3 |
| *- hookeriana* | 2 | 1 | 3 | 2 | 3 | 2 | 1 | | 2 | 2 | 2 |
| *- hyparctica* | 2 | 2 | | 4 | 1 | 1 | 1 | | 3 | | 2 |
| *- nivea* | | 2 | | 2 | 2 | | | 2 | | 2 | 1 |
| *- pulchella* | | | | | 2 | | | | 1 | | |
| *- rubella* | | | | 1 | | | | | 1 | | |
| *- rubricaulis* | | | | 1 | | | | | | | |
| *- stipularis* | | | | | | | | | 1 | | |
| *Primula stricta* | 3 | | 1 | | 2 | 2 | | | | | |
| *Puccinellia phryganodes* | 2 | | | | 2 | 1 | 1 | | | | |
| *- vaginata* | | | | | 2 | 2 | | | | | 1 |
| *Pyrola grandiflora* | 3 | 4 | 3 | 3 | 3 | 4 | 2 | 2 | 3 | 3 | 2 |
| *Ranunculus affinis* | | | | | 1 | | | | 1 | | |
| *- auricomus* | | | | | 1 | | | | | | |
| *- confervoides* | | | | | 1 | 1 | | | | | |
| *- hyperboreus* | 3 | 3 | 2 | 1 | 3 | 2 | 4 | | 3 | 2 | 1 |
| *- nivalis* | 2 | 3 | 2 | 2 | | 2 | 3 | 1 | 2 | 1 | 1 |
| *- pygmaeus* | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 3 |
| *- sulphureus* | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 |
| *Rhodiola rosea* | 3 | 2 | 3 | 1 | 3 | 3 | 1 | 1 | 3 | 2 | 2 |
| *Rhododendron lapponicum* | | | 1 | | 4 | 3 | | 2 | | 2 | 3 |
| *Rumex acetosella* | | | | | | | | | | 1 | 2 |
| *Sagina intermedia* | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |
| *Salix arctica* | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 |
| *- herbacea* | 4 | 4 | 4 | 3 | 1 | | 5 | 4 | 3 | | 3 |
| *Saxifraga aizoides* | | | 2 | 2 | 4 | 3 | | 5 | | 4 | 3 |
| *- caespitosa* | 2 | 2 | 1 | 2 | 2 | 3 | 3 | 5 | 3 | 4 | 1 |
| *- cernua* | 2 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 |
| *- foliolosa* | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 4 | 2 |

| | Draba Sibirica Elv | Test site 3 | Test site 2 | Test site 1 | Constable Pynt | Ugleelv | Hugin Sø | Fleming Fjord | Coloradodal | Ørsted Dal | Olympelven |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Saxifraga hieracifolia* | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 |
| - *hyperborea* | 1 | 2 | | 1 | | | | | 1 | 1 | 1 |
| - *nathorstii* | | | | | 1 | | | 1 | | 2 | 1 |
| - *nivalis* | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |
| - *oppositifolia* | 2 | 3 | 3 | 4 | 4 | 3 | 4 | 5 | 3 | 5 | 3 |
| - *rivularis* | 1 | | | | | | 1 | | | | |
| - *tenuis* | | | 1 | 1 | | | 1 | | | 1 | 1 |
| *Sibbaldia procumbens* | 3 | 2 | 3 | 2 | 3 | 4 | 4 | 3 | 3 | 2 | 3 |
| *Silene acaulis* | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 3 | 4 | 4 |
| *Stellaria crassipes* | | | | | | | | | 1 | | |
| - *edwardsii* | 3 | 4 | 3 | 3 | 3 | 4 | 2 | 1 | 2 | 3 | 2 |
| - *humifusa* | 2 | | | | 2 | 1 | 1 | 1 | | | |
| *Taraxacum arcticum* | | 1 | 1 | 2 | 1 | | 1 | | 2 | | 1 |
| - *croseum s.l.* | 2 | 2 | 3 | 1 | 3 | 3 | 2 | 3 | 3 | 2 | 2 |
| - *phymatocarpum* | | | | 1 | 1 | | | | 1 | | |
| *Thalictrum alpinum* | 3 | 2 | 3 | | 3 | 3 | 4 | 3 | 2 | 2 | |
| *Tofieldia coccinea* | | | | | 2 | | | | 2 | 3 | |
| - *pusilla* | 1 | 2 | 4 | 1 | 3 | 3 | | 2 | | 3 | 3 |
| *Trisetum spicatum* | 3 | 4 | 3 | 3 | 4 | 4 | 5 | 3 | 4 | 4 | 3 |
| *Vaccinium uliginosum* | 5 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 4 | 5 | 5 |
| *Veronica alpina* | 1 | | 3 | | 3 | 2 | 1 | 2 | 1 | 1 | 1 |
| - *fruticans* | | | | | 2 | 1 | | 1 | | | |
| *Viscaria alpina* | | | | 1 | 1 | 2 | | 1 | 2 | 1 | 1 |
| *Woodsia glabella* | | | | 1 | 1 | | | 1 | | 1 | 1 |
| | 112 | 111 | 131 | 117 | 161 | 138 | 104 | 112 | 128 | 128 | 127 |

5 = meget almindelig

4 = almindelig

3 = hist og her

2 = sjælden

1 = meget sjælden

! = cfr. species

# UNDERSØGELSER AF TESTSEISMIKS INDVIRKNING PÅ VEGETATION OG JORDBUND

(INVESTIGATIONS OF THE EFFECTS ON VEGETATION AND SOIL OF SEISMIC SURFACE SHOOTING)

## 1. INTRODUCTION

The vegetational recovery following seismic surface shooting was observed in Jameson Land (test site no.1, 2 and 3). All seven vegetation types occurring on the three test sites were included in the study. Seismic surface shooting was carried out in Jameson Land by ARCO in July-August 1982. Sample plots established before the shooting in 1982 were studied during July 1982 and July 1983. Since the recovery of the vegetation has only been followed one year after the shooting, this report is preliminary. There has been no previous examination of the effect of seismic surface shooting on vegetation in Northeast Greenland.

## 2. METHODS

A seismic test site consists of wooden stakes in clusters along an approximately 6 kilometre long line. The vegetation in sample plots adjacent to the 70cm high wooden stakes with a 2 lbs charge of kinesis (a patended explosive) were analysed before and immediately after the shooting. One year after the shooting the recovery of the vegetation was measured. In order to ensure different levels in details of the recordings, plot size and shapes varied among locations. Higher plant species (including flowering plants, horsetails and club mosses) were identified and their cover were recorded by visiual estimate before and after the shooting. The survival and recovery were evaluated by measuring the maximum and minimum distance from the stake to:

1) torn up individuals

2) killed, but well-rooted individuals

3) damaged, but alive individuals

4) undamaged individuals

In addition photographic records were taken for each of the sample plots. Mosses were treated as one group when estimating recovery.

Additional analysis were made in July 1983 in seven of the most dominating vegetation types at the three test sites (Tab. 7). The vegetation types studied in relation to surface shooting at the three test

sites were:

1) Hummocky meadow (M2)

2) Moist dwarf scrub, rich in mosses (H3)

3) Dry dwarf scrub, with a vegetation cover between 25-75% (H4)

4) Sparse dwarf scrub (H5)

5) Fell-field (H7)

6) Snowbed with a short growth period (S2)

7) Snowpatch with a intermediary growth period (S3)

(See Tab. 8 for further description.) Here the vegetational recovery was registered. These analyses includes the following parametres:

1) the distance from the stake to the nearest alive individual

2) the distance to the most distant damaged individual

3) the thickness of the soil layer torn up

4) the average thickness of the humus layer

5) the description of the soil texture

In addition the sensitivity of the different species to the surface shooting was recorded.

## 3. SITE DESCRIPTIONS AND EFFECTS OF THE SEISMIC SURFACE SHOOTING

### 3.1 TEST SITE No. 1, NOISE TEST No. 4 (NORTHERN ROW OF STAKES )

A sample plot was established between stake no.2 and 3 (S2 and S3) from the east in the northern row of stakes. The sample plot measured 85 x 302 centimetres. On each of the stakes in the shotpoint 2 lbs of kinesis were simultanously brought to explosion. The vegetation in the sample plot is a moist *Cassiope tetragona*, dominated scrub with *Salix arctica*, *Arctagrostis latifolia*, *Eriophorum triste*, *Carex bigelowii* and *Polygonum viviparum*. The moss cover constituted more than 70% before the shooting (Fig. 1 top). The soil is mainly composed of sandy silt

Fig. 1-3

Photographic records from three sample plots at Test site no. 1. The degree of recovery is estimated and classified by the following scale:

1) Torn up or killed.

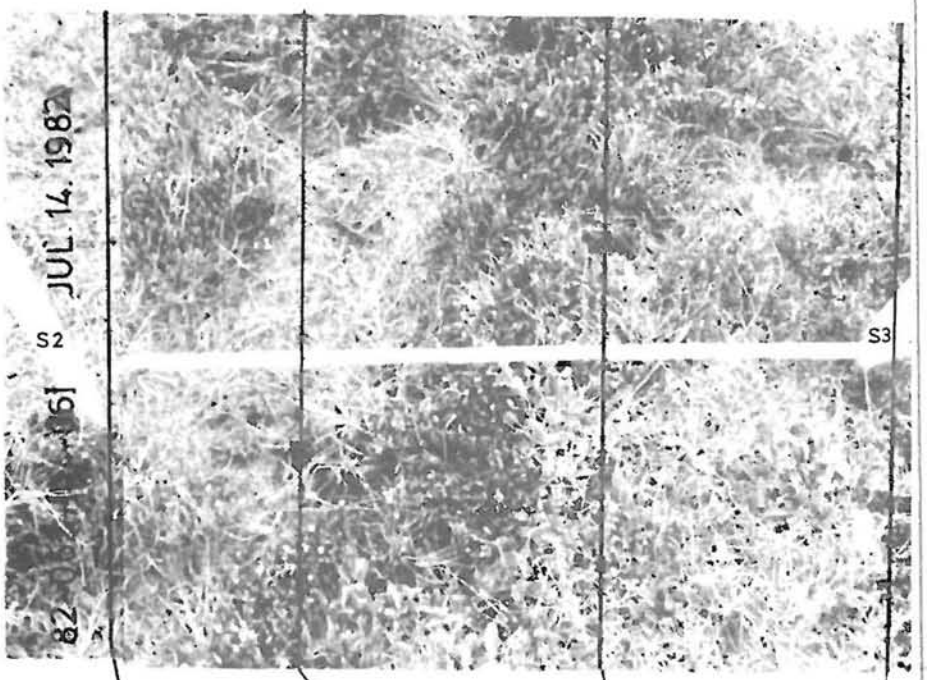
2) Slight recovery: Plants only recovering to less than 5% of the biomass present before the shooting.

3) Moderate recovery: Plants recovering between 5-50% of the biomass present before the shooting.

4) Good recovery: Plants recovering to more than 50% of the biomass present before the shooting.

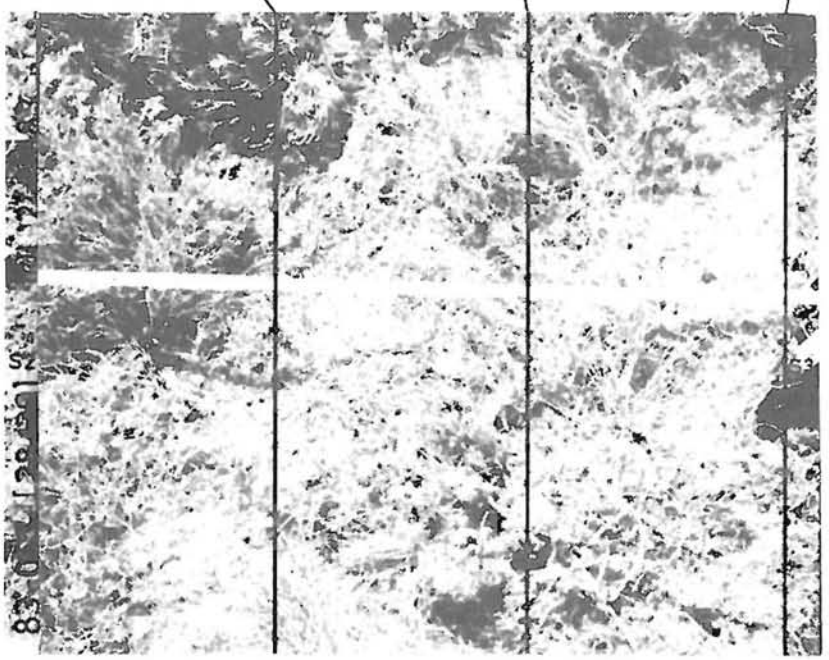
5) Not damaged.

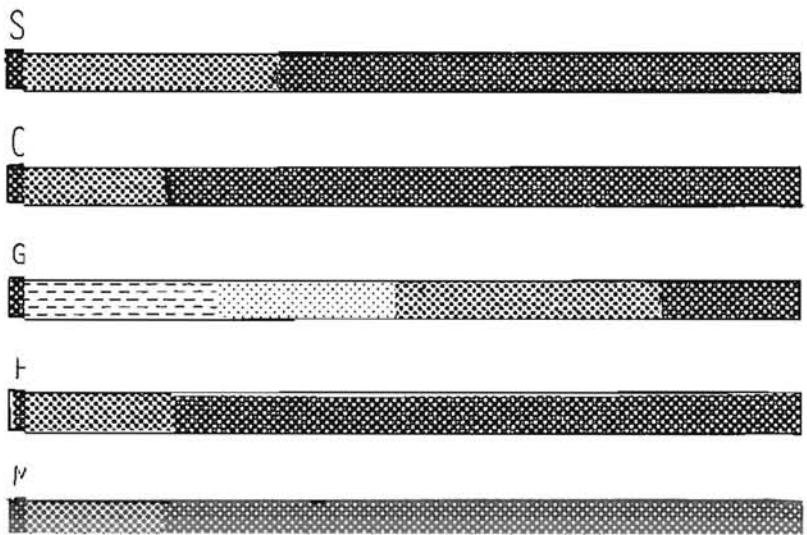
# TEST SITE No.1
# NOISE TEST No.4




LEGEND:

- TORN UP OR KILLED
- SLIGHT RECOVERY
- MODERATE RECOVERY
- GOOD RECOVERY
- NOT DAMAGED



Figu

LEGEND:

TORN UP OR KILLED

SLIGHT RECOVERY

MODERATE RECOVERY

GOOD RECOVERY

NOT DAMAGED

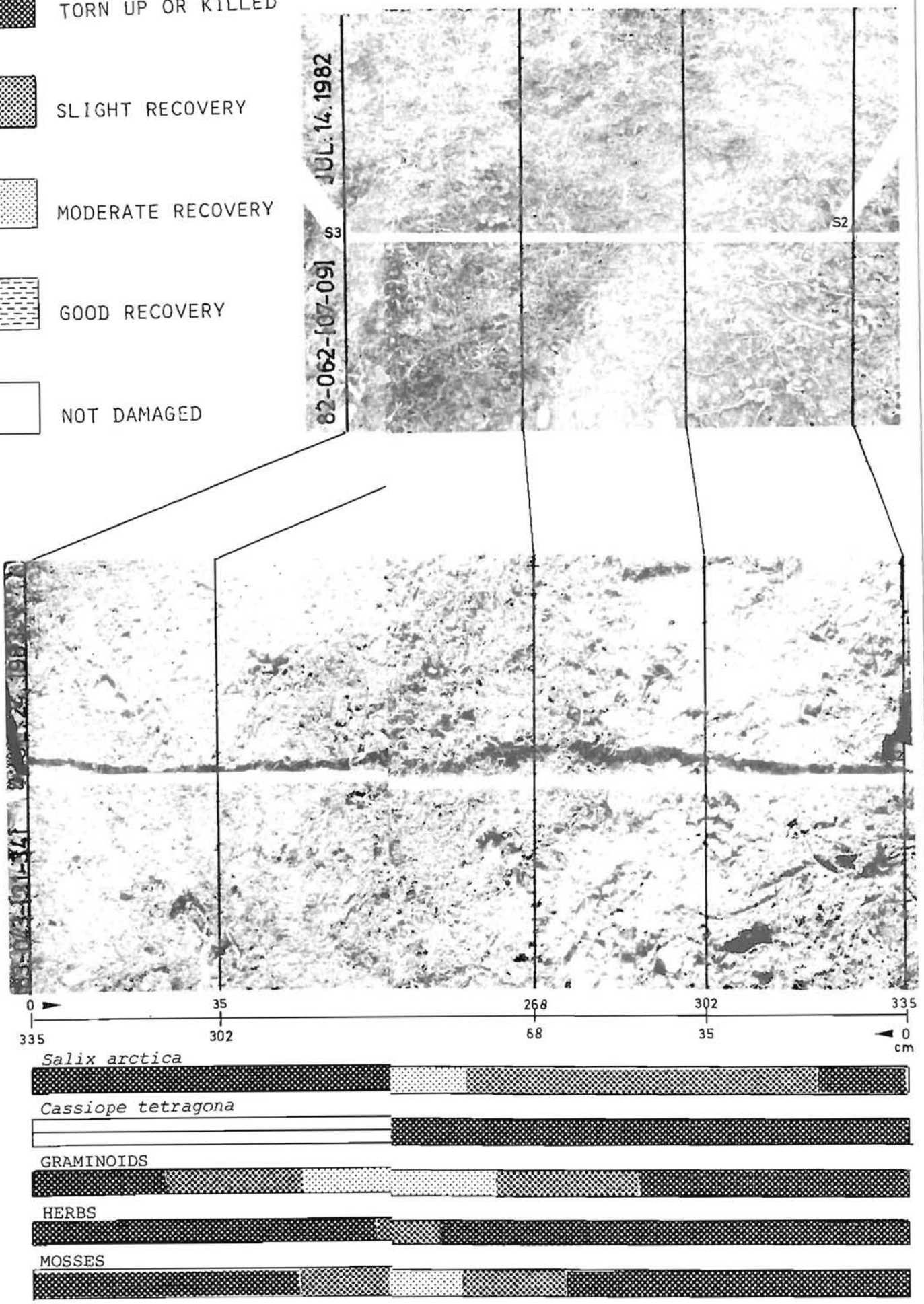
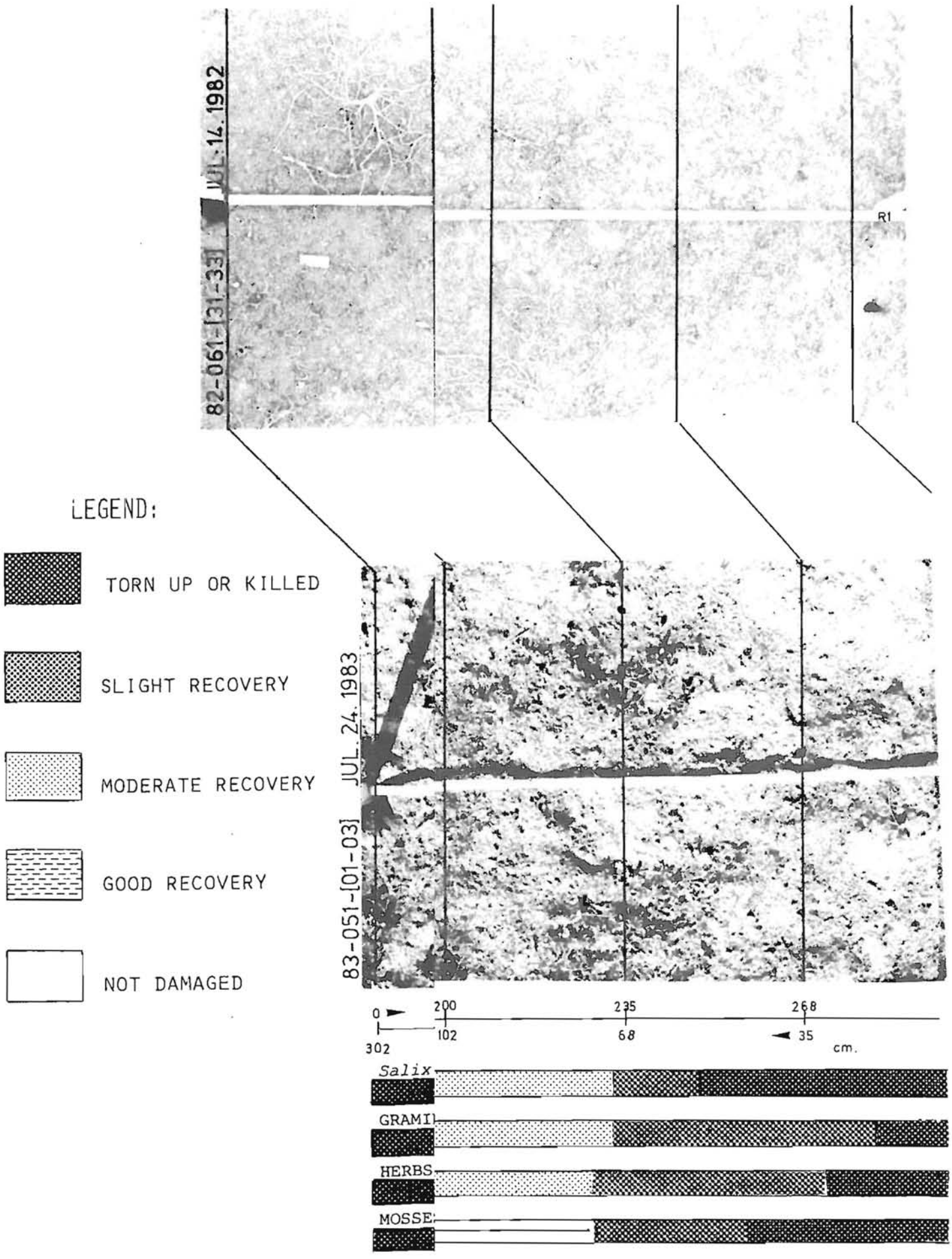


Figure 3


JUL. 14. 1982
82-061-[31-33]
R1
LEGEND:
TORN UP OR KILLED
SLIGHT RECOVERY
MODERATE RECOVERY
GOOD RECOVERY
NOT DAMAGED
JUL. 24. 1983
83-051-[01-03]
0
200
235
268
302
102
68
35
cm.
Salix
GRAMI
HERBS
MOSSE

covered by a 3-4 cm thick humus layer. Species composition and cover of the different higher plant species were recorded immediately before the shooting on July 14, 1982 (Fig.1 top). The blast wave caused defoliation of the shrubs and most herbs and graminoids in the sample plot. One year later, on July 24, 1983 the recovery of the vegetation was evaluated (see figure 1 bottom)

### 3.2 TEST SITE No. 1, NOISE TEST No. 4 (SOUTHERN ROW OF STAKES )

A sample plot was established between stake no. 3 and 2 (S2 and S2) in the southern row of stakes. This sample plot measured 75 x 335 centimetres (Fig. 2). On each of the stakes in the shotpoint 2 lbs of kinesis were simultaneously brought to explosion. The vegetation in the sample plot is a moist *Salix arctica* dominated snowpatch with *Carex bigelowii, Arctagrostis latifolia, Poa pratensis* and *Polygonum viviparum*. Close to S2 a mat of *Cassiope tetragona* occurs. Single individuals of *Eriophorum triste* are seen. The moss cover constituted approximately 10% before the shooting. The soil is mainly composed of sandy silt covered by a 0 - 5 mm thick humus layer. Species composition and cover of different higher plant species were recorded immediately before the shooting on July 14, 1982 (Fig. 2 top). The blast wave caused defoliation of the shrubs and most herbs and graminoids in the plot. One year later, on July 24, 1983 the recovery of the vegetation was evaluated (see figure 2 bottom).

### 3.3 TEST SITE No. 1, NOISE TEST No. 6

A sample plot was established between stake no. 2 and 1 (S2 and S1) from the east in the 4th row of stakes from the south. The sample plot measured 80 x 310 centimetres (Fig 3). On each of the stakes in the shotpoint 2 lbs of kinesis were simultanously brought to explosion. The vegetation in the sample plot is a moist *Salix arctica* dominated snowpatch with a shorter growth period than seen at noise test no. 4, southern row. Other species occuring in this plot are *Poa pratensis, Cerastium arcticum, Silene acaulis, Polygonum viviparum* and few individuals of *Stellaria edwardsii*. The moss cover constitutes less than 10% before the shooting. The soil is mainly composed of silt without a

humus layer. Species composition and cover of the different higher plant species were recorded immediately before the shooting on July 14, 1982. *Salix arctica* was defoliated by the blast wave in the entire plot and most above ground biomass of the herbs and the graminoids were blown off (Fig. 3 top). One year later, on July 24, 1983 the recovery of the vegetation was evaluated (Fig. 3 bottom).

## 3.4 TEST SITE No. 1, NOISE TEST No. 7

### 3.4.1. Stake No. 1

The vegetation close to the stake is a very sparse snowbed vegetation on a moist, stony ground without a humus layer. This vegetation consists mainly of *Salix arctica* and *Luzula confusa* (Fig. 4a). Immediately after the shooting (Fig. 4b) the vegetation is defoliated to a distance of approximately 2 metres from the stake. Individuals of *Salix* 15cm from the stake were still rooted after the shooting. At the inspection one year after the shooting, *Salix* at a distance closer than 20cm from the stake was generally found killed. Between 20-160cm *Salix* generally had recovered, but showed smaller and almost exclusively vegetative growth. However, one individual at a distance on 70cm from the stake seemed undamaged. The graminoids, almost exclusively represented by *Luzula confusa* show smaller and mainly vegetative growth when damaged from the blast. Dead leaves from the previous years have mostly been removed by the blast. Generally, the damage on this site is minimal and the recovery is very good.

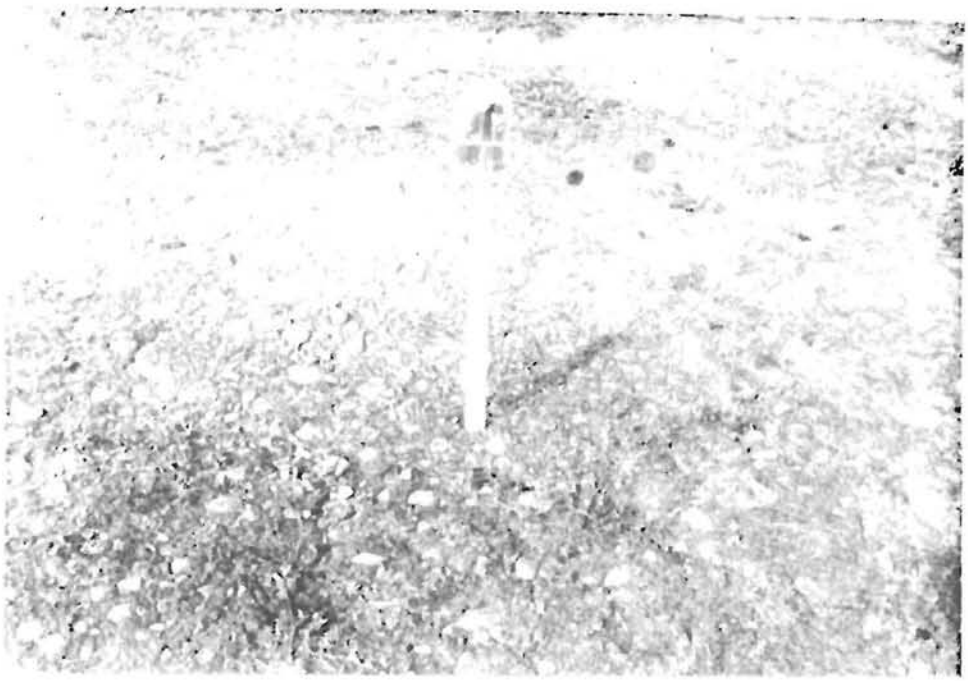


FIG. 4a. The first stake from the north in the eastern row of stakes (stake no. 1) with 2lbs of kinesis. Stony snowbed vegetation with short growth period (Type S2). Phot. no. 82-061-01 July 14, 1982.

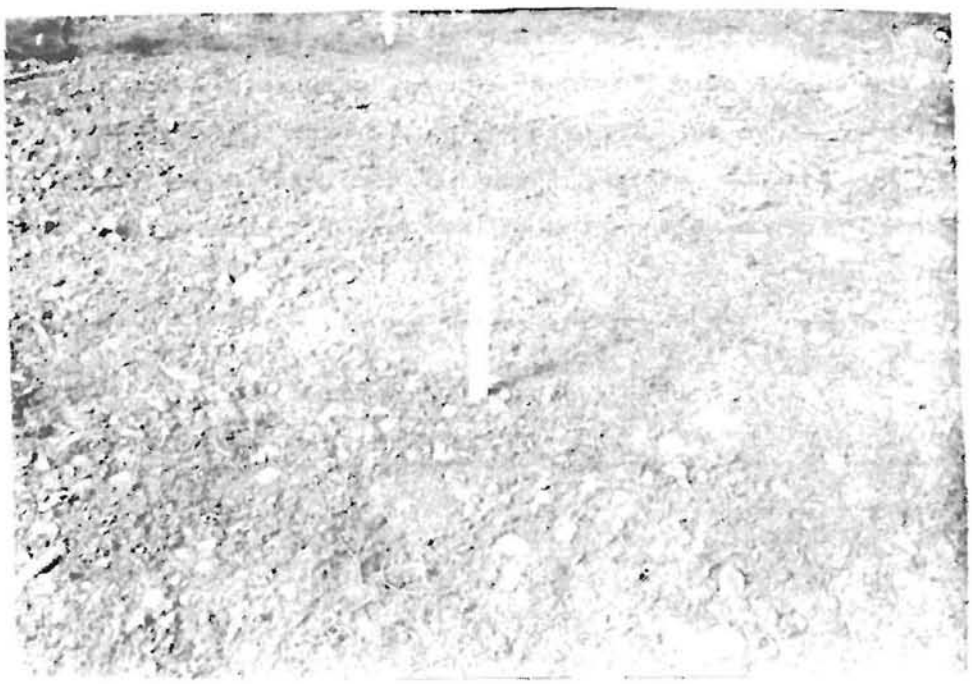


FIG. 4b. Stake no. 1 immediately after the shooting Phot. no. 82-061-07 July 14, 1982.

FIG. 4c. Stake no. 1 one year after the shooting. Phot. no. 83-051-26 JULY 24, 1983.

TABLE 1 - The table shows the effect of the surface shooting at a given distance from stake no.1 for dwarf shrubs, graminoids, herbs and mosses respectively. Since the damaging effect is very heterogenous in the same radius to the stake, there is usually a considerable overlap between the different categories of damages. ? = observation impossible or questionable.

| KIND OF DAMAGE | Dwarf shrubs | Grami-noids | Herbs | Mosses |
|---|---|---|---|---|
| | DISTANCE FROM THE STAKE (cm) | | | |
| Individuals torn up (maximum distance) | none | 30 | ? | ? |
| Individuals killed | 20-22 | 2-? | ? | ? |
| Individuals damaged, but live | 20-160 | ? | 4-180 | ? |
| Individuals undamaged (minimum distance) | 70 | 35 | 100 | ? |

TABLE 2 - The table shows the effect of the surface shooting at a given distance from stake no.3 for dwarf shrubs, graminoids, herbs and mosses respectively. Since the damaging effect is very heterogenous in the same radius to the stake, there is usually a considerable overlap between the different categories of damages. ? = observation impossible or questionable.

| | Dwarf shrubs | Grami-noids | Herbs | Mosses |
|---|---|---|---|---|
| KIND OF DAMAGE | DISTANCE FROM THE STAKE (cm) | | | |
| Individuals torn up (maximum distance) | 140 | ? | ? | 120 |
| Individuals killed | 40-210 | ? | ? | ? |
| Individuals damaged, but live | 30-230 | 15-175 | 60-? | ? |
| Individuals undamaged (minimum distance) | 190 | 30 | 130 | 110 |

3.4.2. Stake no. 3

The vegetation close to stake 3 is a dry *Cassiope tetragona* dominated scrub with a non-active frostboil (Fig. 5a). *Salix arctica, Carex scirpoidea* and *Polygonum viviparum* occur among others near the stake. *Cassiope* was partly torn up by the blasting to a distance of 140cm. However, only slight elevations of few centimetres in the terrain seem to protect the shrubs on the lee side very efficient against the blast. Most shrubs were defoliated to a distance of approximately 230 cm immediately after the shooting, most shrubs were defoliated to a distance of approximately 230cm. The graminoids, herbs and mosses most damaged were those found tangled with the scrub, whereas the open vegetation on the frostboils only has been damaged to a limited extent.

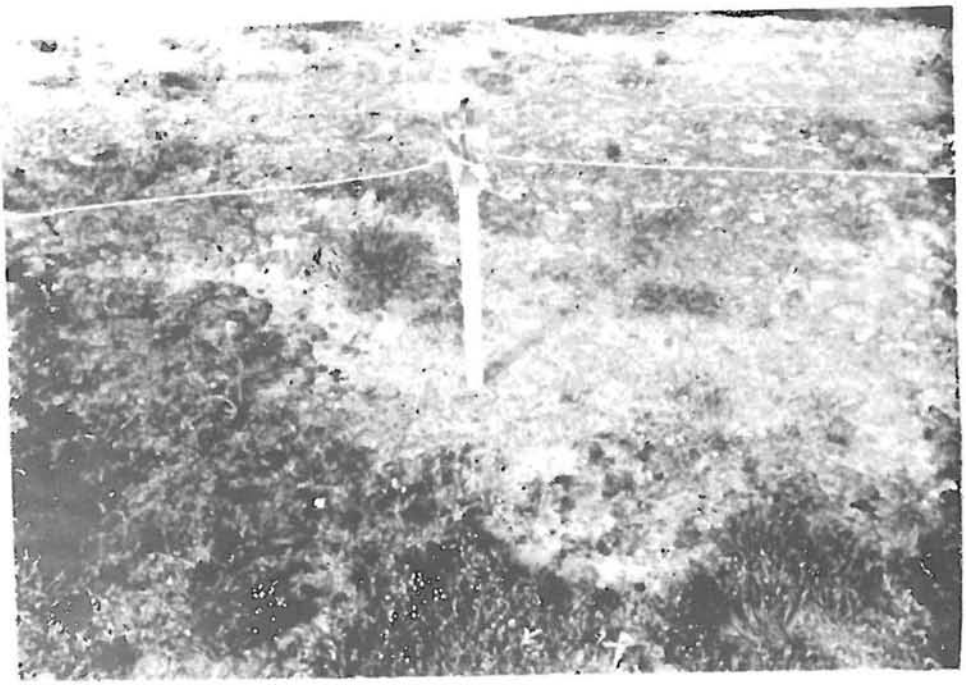


FIG. 5a. The 3rd stake from the north in the eastern row of stakes (stake no. 3) with 2lbs of kinesis. Dry dwarf scrub with frostboil (type H4). The vegetation is dominated by *Cassiope tetragona*. Phot. no. 82-061-02 July 14, 1982.

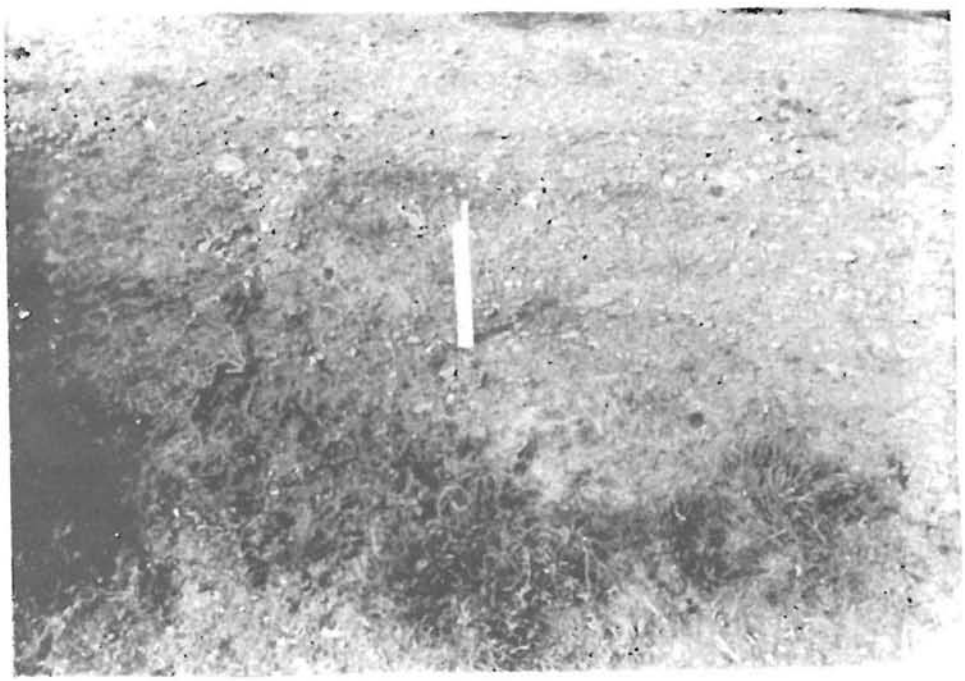


FIG. 5b. Stake no. 3 immediately after the shooting Phot. no. 82-061-08 July 14, 1982.

FIG. 5c. Stake no. 3 one year after the shooting. Phot. no. 83-051-27 July 24, 1983.

TABLE 3 - The table shows the effect of the surface shooting at a given distance from stake no.3 for dwarf shrubs, graminoids, herbs and mosses respectively. Since the damaging effect is very heterogenous in the same radius to the stake, there is usually a considerable overlap between the different categories of damages. ? = observation impossible or questionable.

| KIND OF DAMAGE | Dwarf shrubs | Grami-noids | Herbs | Mosses |
|---|---|---|---|---|
| | DISTANCE FROM THE STAKE (cm) | | | |
| Individuals torn up (maximum distance) | 180 | ? | ? | 110 |
| Individuals killed | 30-130 | ? | ? | ? |
| Individuals damaged, but live | 20-170 | 35-150 | 110-? | ? |
| Individuals undamaged (minimum distance) | 110 | 110 | 50 | 115 |

3.4.3. Stake no. 5

The vegetation close to stake no. 5 is a dry *Cassiope tetragona* dominated dwarf scrub with open stony patches (Fig. 6a). *Salix arctica* and *Luzula confusa* constitute most of the sparse vegetation on the stony patches. *Cassiope tetragona* was partly torn up by the blasting to a distance of 180cm (Fig. 6b). In the main, the effect of the shooting on the vegetation is very similar to conditions described for stake no. 3.

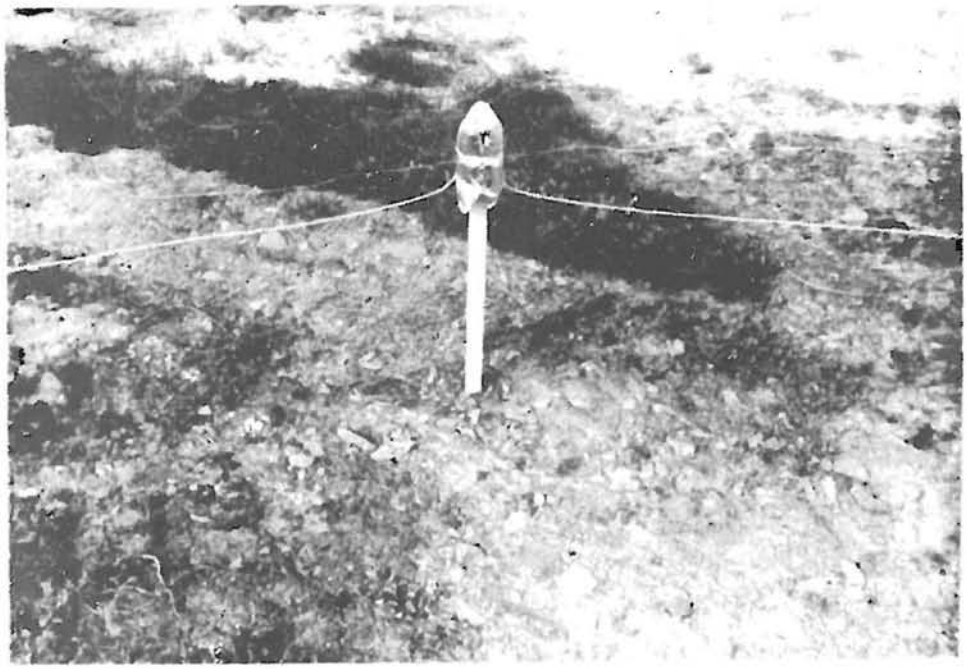


FIG. 6a. The 5th stake from the north in the eastern row of stakes (stake no. 5) with 2lbs of kinesis. Dry dwarf scrub (type H4) with open stony patches. The vegetation is dominated by *Cassiope tetragona* Phot. no. 82-061-03 July 14, 1982.

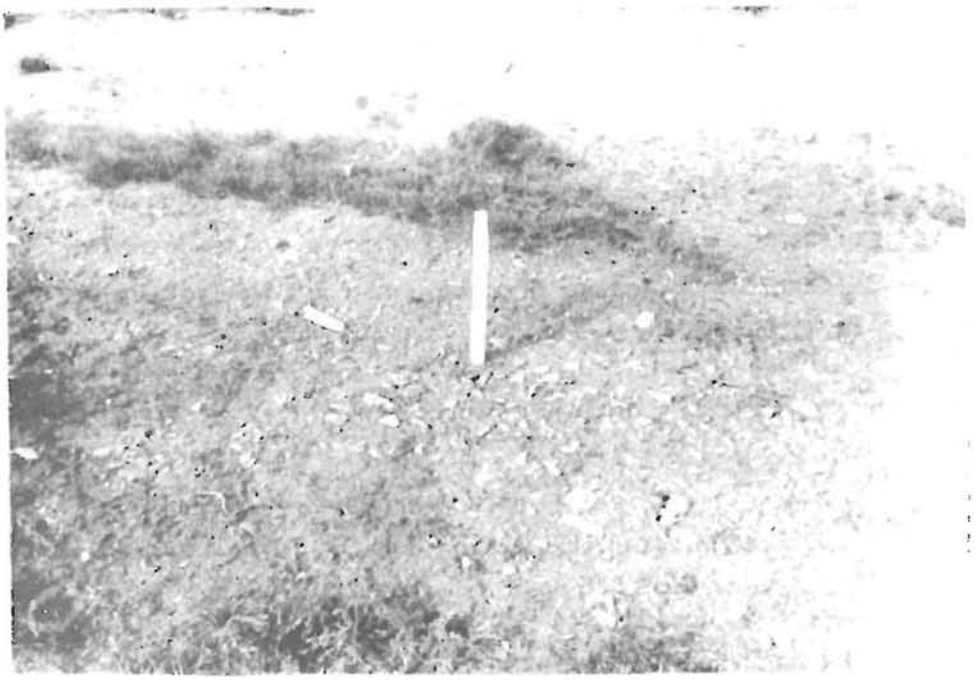


FIG. 6b. Stake no. 5 immediately after the shooting. Phot. no. 82-061-09 July 14, 1982.

FIG. 6c. Stake no. 5 one year after the shooting. Phot. no. 83-051-28 July 24, 1983.

TABLE 4 The table shows the effect of the surface shooting at a given distance from stake no.5 for dwarf shrubs, graminoids, herbs and mosses respectively. Since the damaging effect is very heterogenous in the same radius to the stake, there is usually a considerable overlap between the different categories of damages. ? = observation impossible or questionable.

| KIND OF DAMAGE | Dwarf shrubs | Grami-noids | Herbs | Mosses |
|---|---|---|---|---|
| | DISTANCE FROM THE STAKE (cm) | | | |
| Individuals torn up (maximum distance) | 140 | ? | ? | 80 |
| Individuals killed | 2-200 | ? | ? | 50-80 |
| Individuals damaged, but live | 18-200 | 15-130 | ? | ? |
| Individuals undamaged (minimum distance) | 140 | 70 | 130 | 90 |

3.4.4. Stake no. 7

The vegetation close to stake no. 7 is a *Cassiope* dominated dry scrub on patterned ground (Fig. 7a). *Salix arctica* and *Poa pratensis* occur scattered in the vegetation. More than 50% of the ground is covered with organic crust. The damage on the dwarf shrubs is more severe than seen at stake no. 3 and 5. Immediately after the shooting, most shrubs were defoliated to a distance of approximately 280cm from the stake (Fig. 7b). One year after the shooting (Fig. 7c), most individuals of *Cassiope tetragona* were killed to a distance of 250cm from the stake. On the other hand *Salix arctica* showed a good recovery as close as 30cm from the stake.

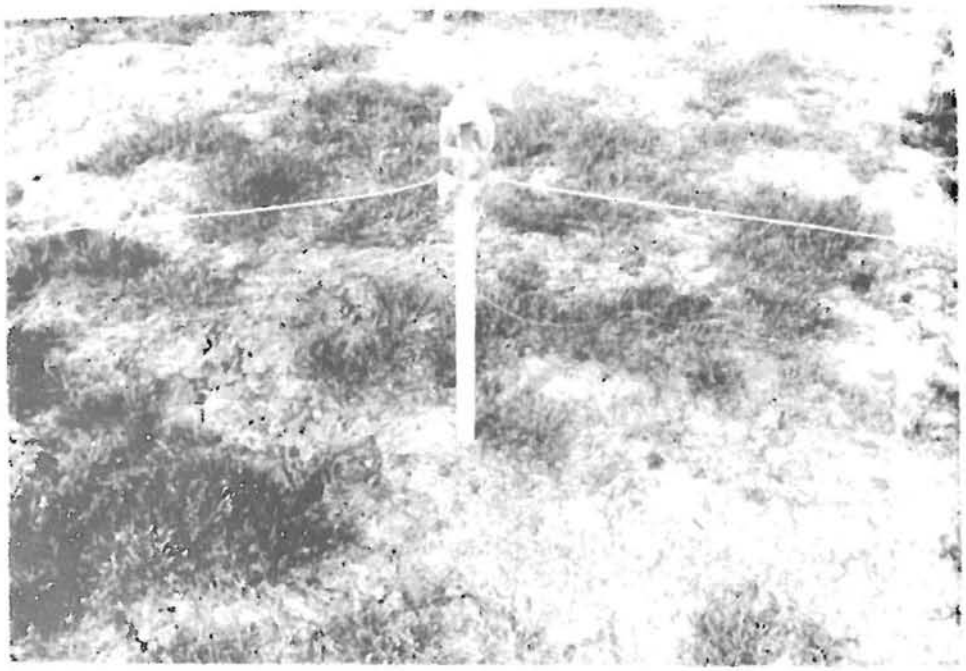


FIG. 7a. The 7th stake from the north in the eastern row of stakes (stake no. 7) with 2lbs of kinesis. Dry dwarf scrub (type H4) on patterned ground dominated by *Cassiope tetragona*. Phot. no. 82-061-04 July 14, 1982.

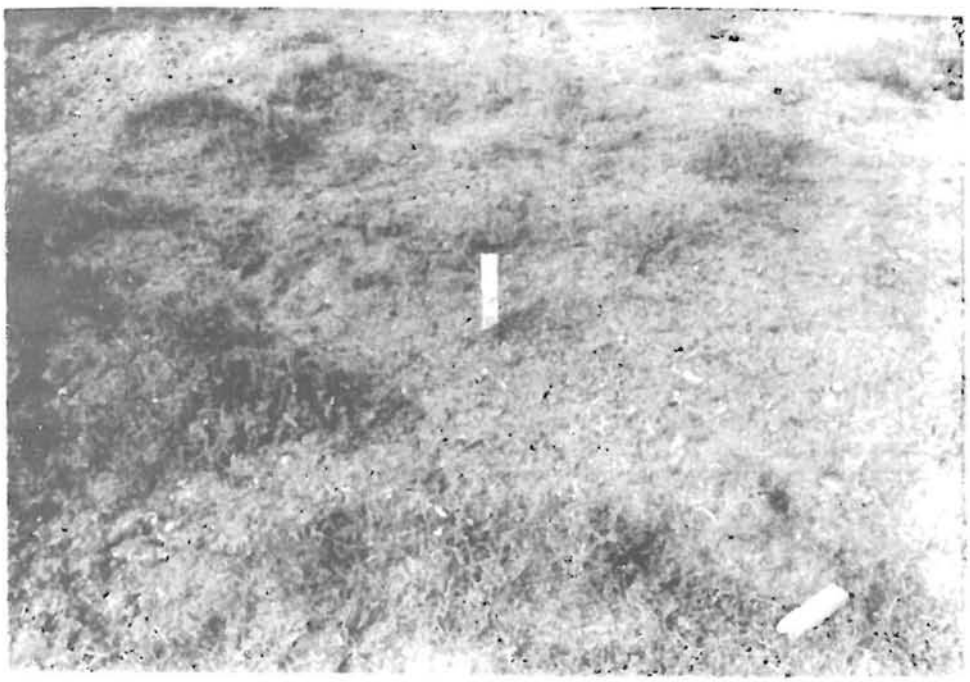


FIG. 7b. Stake no. 7 immediately after the shooting. Phot. no. 82-061-10 July 14, 1982.

FIG. 7c. Stake no. 7 one year after the shooting. Phot. no. 83-051-29 July 24, 1983.

TABLE 5 - The table shows the effect of the surface shooting at a given distance from stake no.9 for dwarf shrubs, graminoids, herbs and mosses respectively. Since the damaging effect is very heterogenous in the same radius to the stake, there is usually a considerable overlap between the different categories of damages. ? = observation impossible or questionable.

| | Dwarf shrubs | Grami-noids | Herbs | Mosses |
|---|---|---|---|---|
| KIND OF DAMAGE | DISTANCE FROM THE STAKE (cm) | | | |
| Individuals torn up (maximum distance) | 190 | ? | ? | 150 |
| Individuals killed | 5-270 | ? | ? | ? |
| Individuals damaged, but live | 30-280 | 15-110 | 50-120 | ? |
| Individuals undamaged (minimum distance) | 160 | 120 | 220 | 90 |

3.4.5. Stake no. 9

The vegetation close to stake no. 9 is an open, dry *Cassiope tetragona* dominated scrub on patterned ground (Fig. 8a). The humus layer varies from 0 to 1cm on a silty soil. Immediately after the shooting (Fig. 8b), most shrubs were defoliated to a distance exceeding 250cm from the stake. As seen for the previously mentioned stakes, *Cassiope* was generally killed to a distance of 250cm from the stake, whereas *Salix arctica* showed considerable recovery as close as 30cm from the stake. The recovery of *Salix* depends of the nature of the substrate where it occured. Generally the *Salix* growing on a bare and silty ground showed much better recovery, than individuals growing between *Cassiope* on soil with a humus layer.

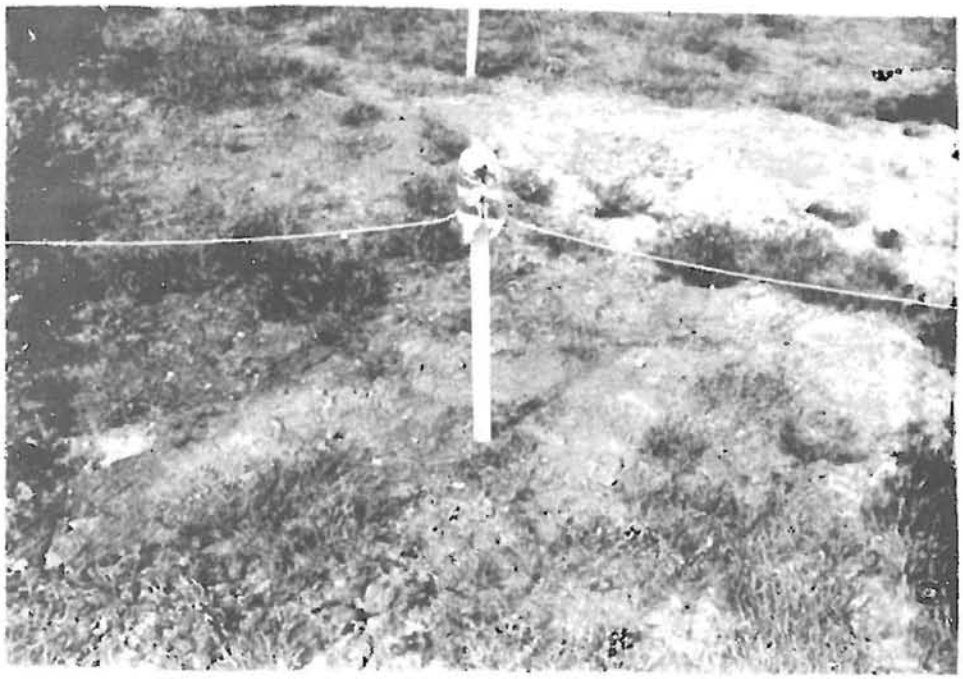


FIG. 8a. The 9th stake from the north in the eastern row of stakes (stake no. 9) with 2lbs of kinesis. Dry dwarf scrub (type H4) on patterned ground dominated by *Cassiope tetragona*. Phot. no. 82-061-05 July 14, 1982.

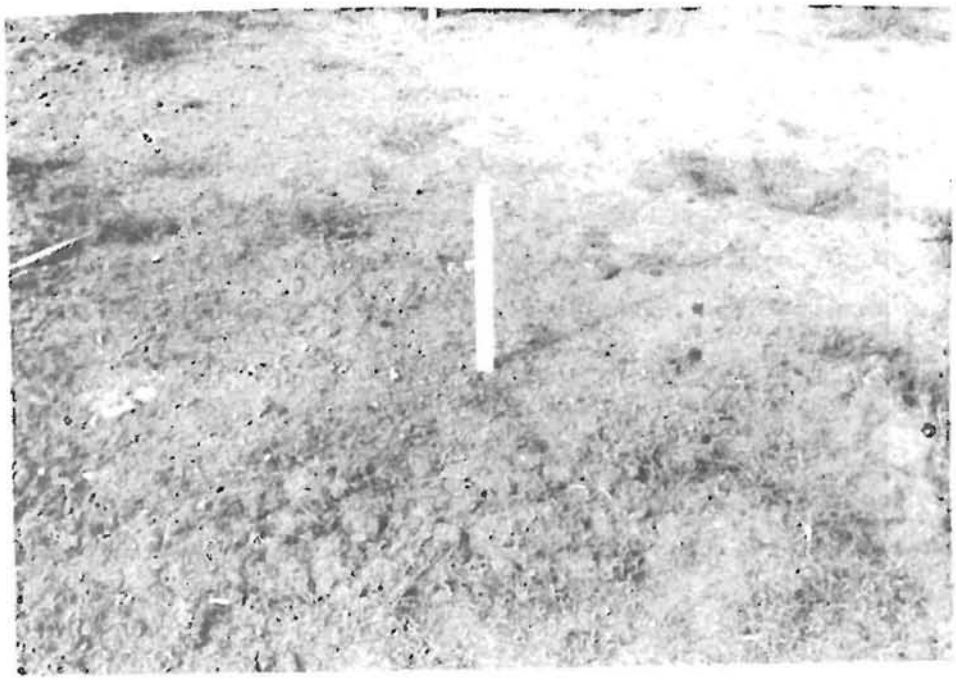


FIG. 8b. Stake no. 9 immediately after the shooting. Phot. no. 82-061-11 July 14, 1982.

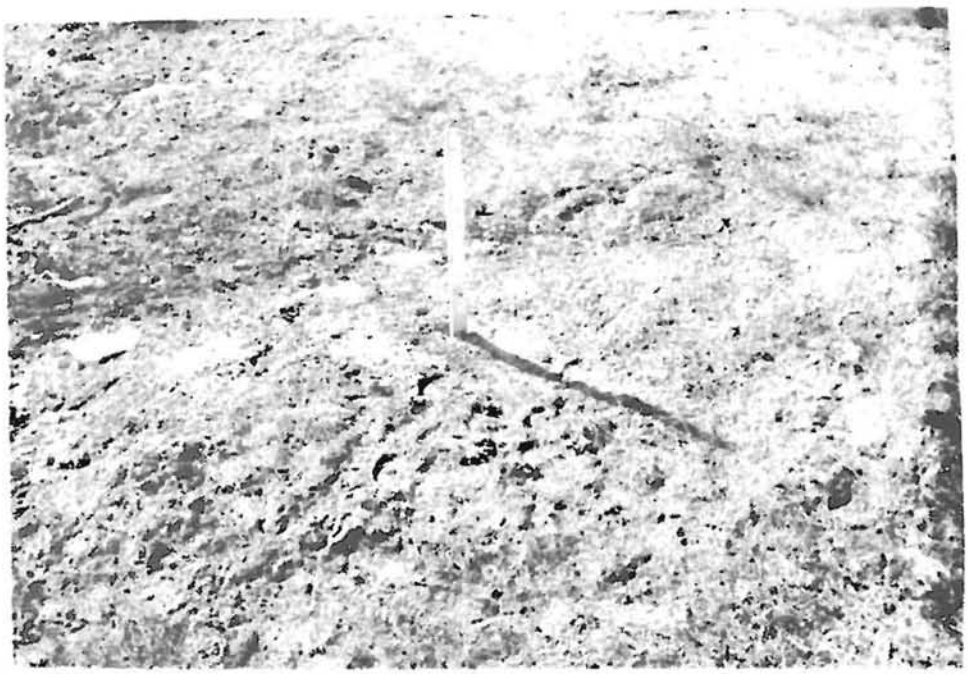


FIG. 8c. Stake no. 9 one year after the shooting. Phot. no. 83-051-30 July 24, 1983.

TABLE 6 - The table shows the effect of the surface shooting at a given distance from stake no.11 for dwarf shrubs, graminoids, herbs and mosses respectively. Since the damaging effect is very heterogenous in the same radius to the stake, there is usually a considerable overlap between the different categories of damages. ? = observation impossible or questionable.

| KIND OF DAMAGE | Dwarf shrubs | Grami-noids | Herbs | Mosses |
|---|---|---|---|---|
| | DISTANCE FROM THE STAKE (cm) | | | |
| Individuals torn up (maximum distance) | 150 | ? | ? | 115 |
| Individuals killed | 1-230 | ? | ? | 5-100 |
| Individuals damaged, but live | 7-240 | 13-70 | ? | ? |
| Individuals undamaged (minimum distance) | 90 | 90 | none | 100 |

3.4.6. Stake no. 11

The vegetation close to stake no. 11 is a *Cassiope tetragona* dominated dry dwarf scrub (Fig. 9a) representing the most closed vegetation of the six studied stakes in noise test no. 7. The damaging effect of the shooting at stake no. 11 is very similar to the effect seen at stake no. 7 and 9. Plants occupying even very shallow depressions have much better possibilities of surviving than plants on level terrain or raising terrain facing the stake. These differences in the microrelief is responsible for the varied damage caused by the shooting in the same radius from the stake.

FIG. 9a. The 11th stake from the north in the eastern row of stakes (stake no. 11) with 2lbs of kinesis. Dry dwarf scrub (type H4) dominated by *Cassiope tetragona*. Phot. no. 82-061-06 July 14, 1982.

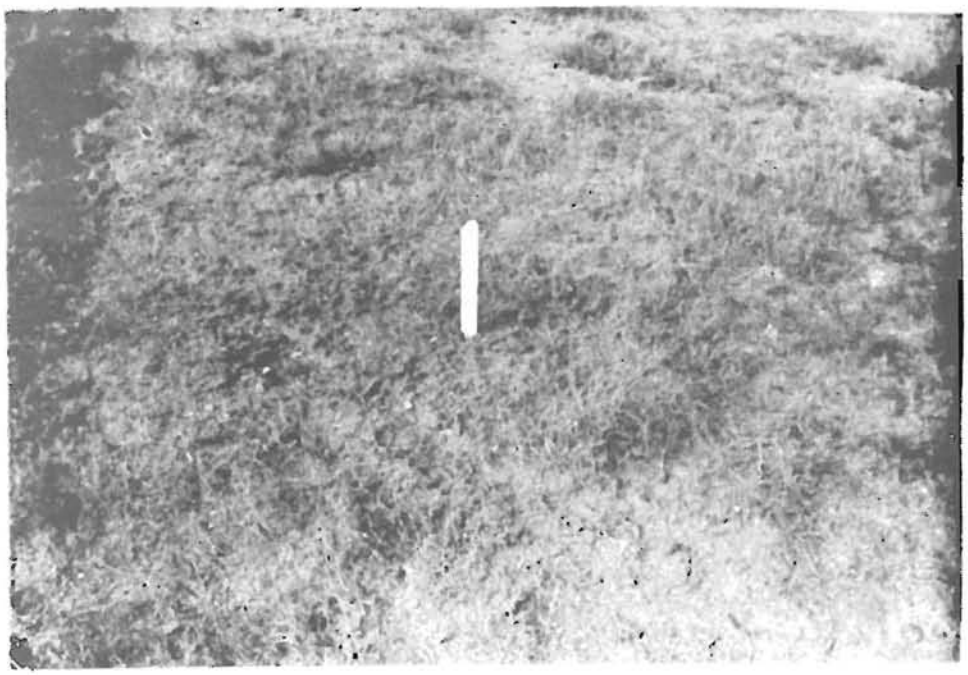


FIG. 9b. Stake no. 11 immediately after the shooting. Phot. no. 82-061-12 July 14, 1982.

FIG. 9c. Stake no. 11 one year after the shooting. Phot. no. 83-051-31 July 24, 1983.

## 3.5. TEST SITE No. 3, SHOT POINT No. 041

A sample plot was established at stake no. 5 from the south in the eastern row. The sample plot was established in a tussocky graminoid marsh on a stony former river bed with solifluction in westerly direction. The dominating species on the tussocks are *Carex bigelowii*, *Salix arctica*, *Trisetum spicatum* and *Polytrichum* sp.. In the interjacent depressions *Arctagrostis latifolia*, *Ranunculus sulphureus* and *Carex lachenalii* are the dominating species.

FIG. 10a. *Eriophorum triste- Carex saxatilis* marsh before surface shooting. Test site 3. Phot. no. 83-087-10 July 30, 1982.

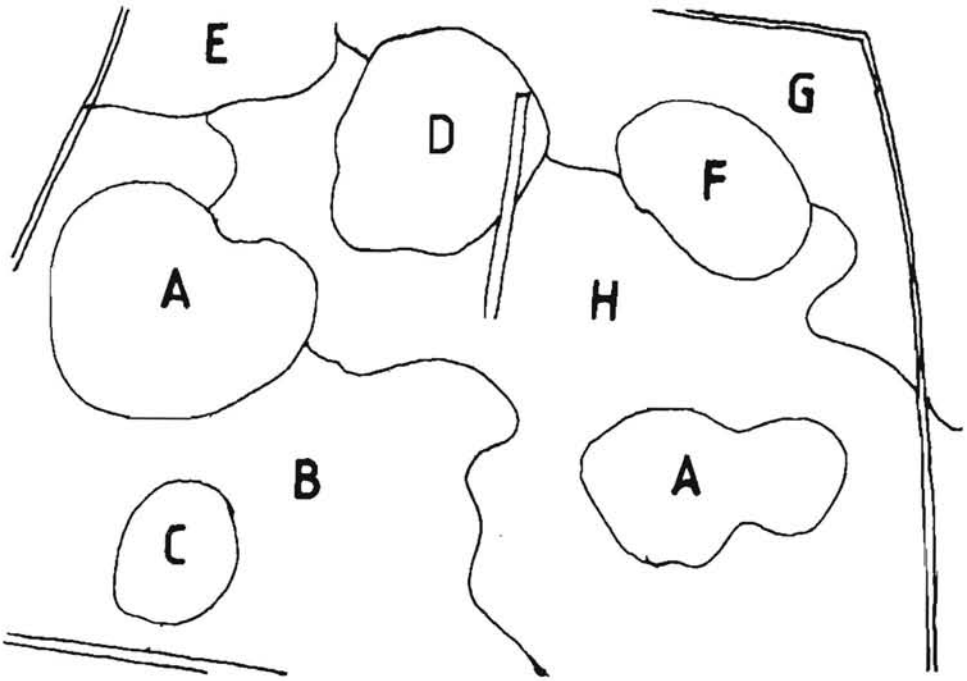



FIG. 10b. Sketch of the sampling site showing the placing and distribution of the vegetation units. A: Tussock with *Salix arctica, Carex bigelowii, Carex lachenalii, Koenigia islandica, Eriophorum triste Trisetum spicatum, Festuca rubra, Ranunculus sulphureus, Erigeron humilis, Poa pratensis, Cerastium cerastoides* and *Arctagrostis latifolia*. Cover of phanerogams: 75%; cover of mosses: 25%. B: Lower area without *Salix arctica*; dominated by *Carex bigelowii, Polygonum viviparum, Carex lachenalii, Arctagrostis latifolia, Trisetum spicatum* and *Eriophorum triste*. C: Depression with *Carex saxatilis*. Periodically water filled. D: Tussock - more rich in mosses, but with the same species composition as A and a cover of phanerogams and mosses of 70% and 30%, respectively. E: Lower area with *Salix arctica, Erigeron humilis, Polygonum viviparum, Poa pratensis* and *Carex lachenalii*. F: Tussock: as A and D. G: Lower area than A and F with a more open vegetation cover than area A. *Carex lachenalii* dominates, moreover *Polytricum* sp. occurs. H: Moss covered depression.

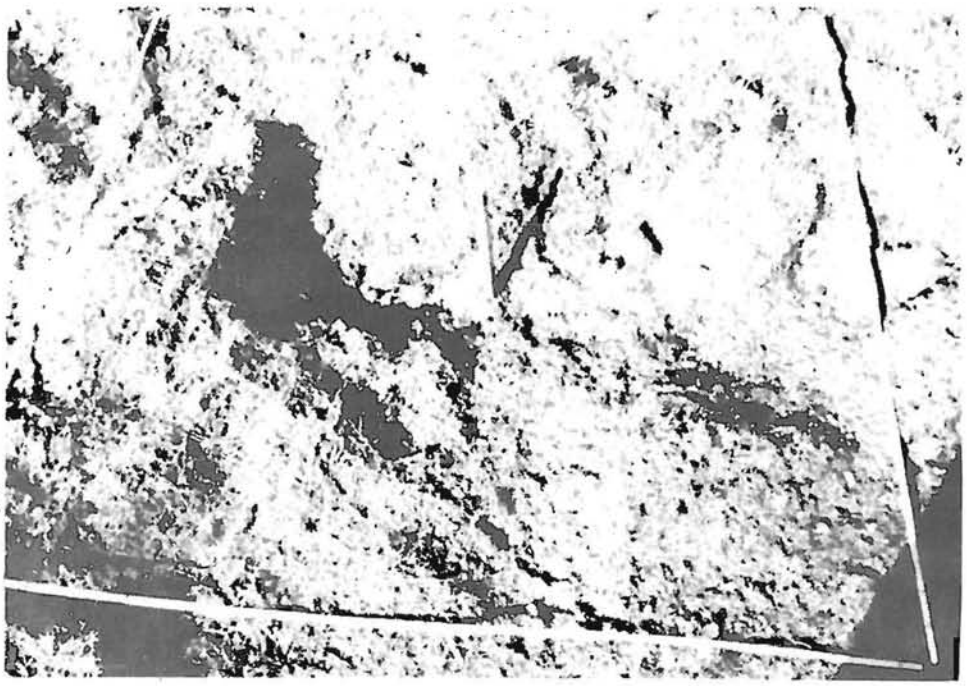


FIG. 10c. Sampling site at SP 041C, test site 3 immediately after the surface shooting. Phot. no. 83-087-9 August 1, 1982.

The sampling sites were visited on August 1, 1982, the day after the shooting, and the damage on the vegetation was registered.

All *Salix arctica* individuals in an area up to 2 metres from the stake were defoliated. Seemingly, the lignified parts of the dwarf shrubs were intact. Inflorescences and leaves more than 5 cm above the ground were blown away, and generally the remaining leaves were burnt. In areas with big Sphagnum tussocks parts of these were torn up and spread over a large area. Nearly all the vegetation in the protected depressions was intact.

As the marsh is formed on an old river bed with big stones, the humus layer is thin and the plants are not rooted in the very coarse-textured soil. The surface shooting has caused a great damage to the active layer in this vegetation type compared with the recordings from test site 2, because of the stony layer.

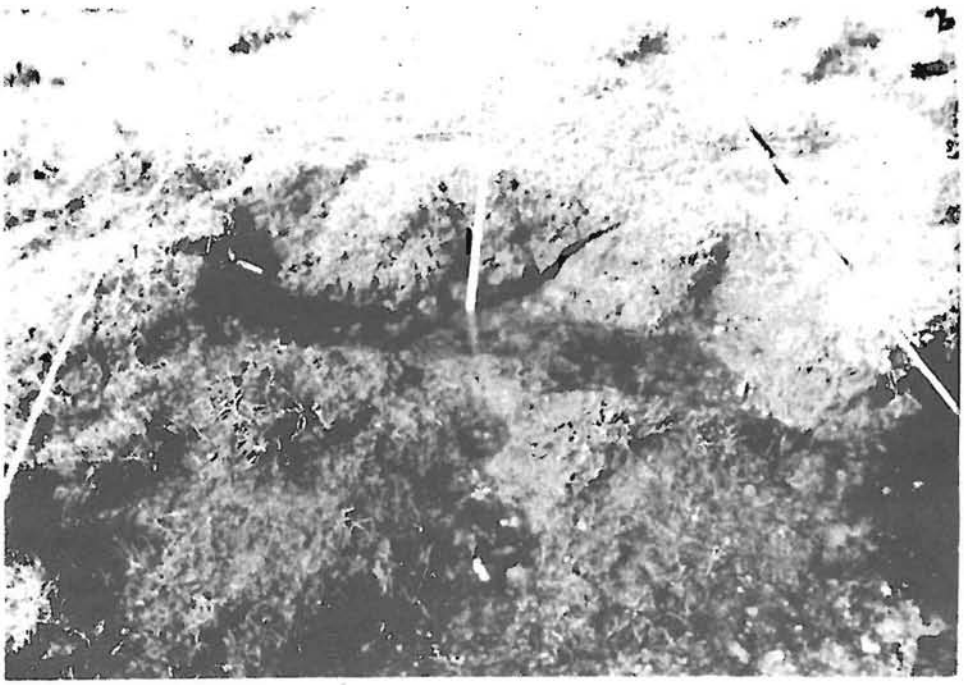


FIG 10d. Sampling site at SP 041C one year after the surface shooting. Phot. no. 83-043-6 July 15, 1983.

On July 15, 1983, the sampling sites were visited, and a description of the damage on vegetation and soil was recorded (Phot. no. 83-043-6). The area within 85 cm from the stake is totally without vegetation. Only few dead individuals of *Salix arctica* are seen. The upper part of the soil (5-10 cm) is torn up. Outside this area few herbs have produced new leaves. The species in question are *Polygonum viviparum*, *Arctagrostis latifolia*, *Ranunculus sulphureus* and *Carex bigelowii*. The total cover of phanerogams is reduced from 75% to about 5%, and the moss cover from 25% to about 2% within the four square metres. The only places of intact vegetation are the protected sides of the tussocks. Open water is standing in the centre of the site, this can be due to the fact that the sampling site was examined earlier this year.

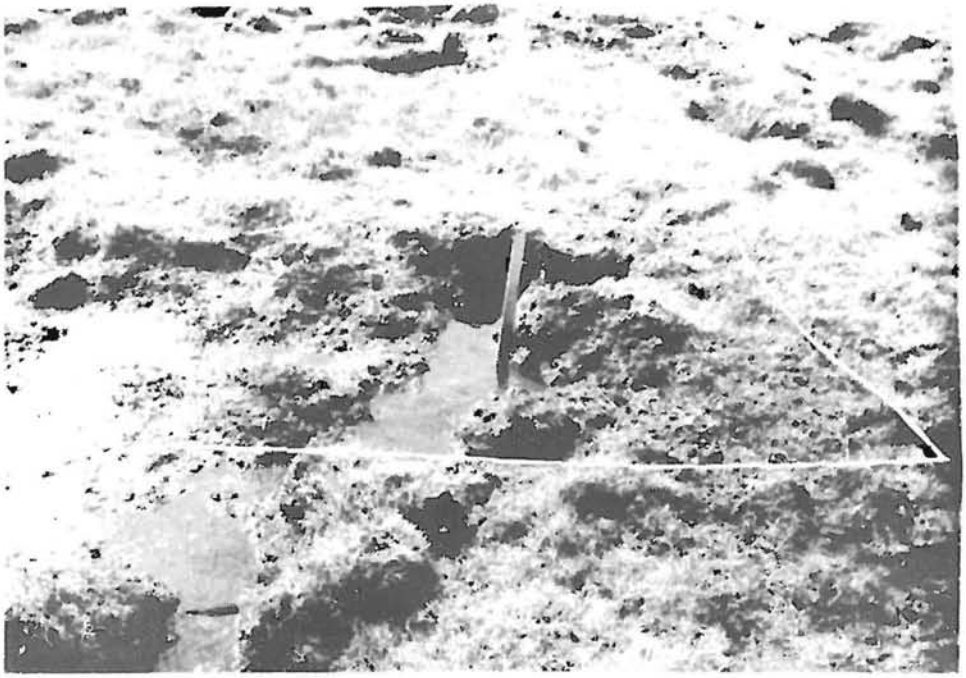


FIG. 10e. Damage on marsh vegetation. The vegetation is intact on the protected sides of the tussocks. Test site 3, SP 041C. Phot. no. 83-043-8 July 15, 1983.

TABLE 7 - The table shows the effect of the surface shooting at a given distance from stake no.1 for dwarf shrubs, graminoids, herbs and mosses respectively. Since the damaging effect is very heterogenous in the same radius to the stake, there is usually a considerable overlap between the different categories of damages. ? = observation impossible or questionable.

| KIND OF DAMAGE | Dwarf shrubs | Grami-noids | Herbs | Mosses |
|---|---|---|---|---|
| | DISTANCE FROM THE STAKE (cm) | | | |
| Individuals torn up (maximum distance) | 75 | 85 | ? | 185 |
| Individuals killed | 50-150 | 50-100 | ? | 65-125 |
| Individuals damaged, but live | 75-145 | 70-135 | ? | ? |
| Individuals undamaged (minimum distance) | 125 | 75 | 90 | 85 |

TABLE 8

Summary of the damaging effect of the seismic surface shooting plots on six vegetation types (see Table 9 for names) one year after the shooting. The table shows environmental and damaging effects for each type found in the plots. Distances are measured from the wooden stake on top of which 2lbs of kinesis was brought to explosion.

| | VEGETATION TYPE | | | | | | |
|---|---|---|---|---|---|---|---|
| | H3 | H3 | H3 | H4 | H4 | H4 | H4 |
| | TEST SITE- AND SHOT POINT NUMBER | | | | | | |
| ENVIRONMENTAL FACTORS | TS01 SP44 | TS02 SP?? | TS03 SP?? | TS01 SP01 | TS01 SP12 | TS01 SP77 | TS02 SP?? |
| Number of sampled plots | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Moisture regime | moist | moist | moist | dry | dry | dry | dry |
| Tilting degree and exposure | 0-5;N | 0-5;W | 0 | 0-5;N | 0-5;N | 0-5;N | 0 |
| Estimate of plant cover (%) | 92 | 85 | 90 | 35 | 46 | 52 | 27 |
| Soil texture | sandy silt | sandy silt | sandy silt | silty sand | stony grave-ly sand | sandy silt | silty sand |
| Depth of humus layer (cm) | 4 | 8 | 9 | 2 | 5 | 2 | 3 |
| Depth to stone layer (cm) | >20 | >20 | >20 | 7->20 | 3-20 | >20 | >20 |
| Altitude of site (m) | 470 | 190 | 295 | 460 | 460 | 500 | 195 |
| Maximal vegetation hight (cm) | 12 | 10 | 15 | 9 | 10 | 10 | 8 |
| DAMAGING EFFECTS: | | | | | | | |
| Radius where all the vegetation is torn up or killed (cm) | 25 | 20 | 52 | 30 | 37 | 22 | 22 |
| Maximum distance of visible damage to the vegetation (cm) | 236 | 195 | 185 | 210 | 208 | 209 | 195 |
| Maximum thickness of soil removed by the blast (cm) | 8 | 10 | 8 | 9 | 10 | 7 | 1 |

TABLE 8 (continued)

Summary of the damaging effect of the seismic surface shooting on six vegetation types (see Table 9 for names) one year after the shooting. The table shows environmental and damaging effects for each type found in the plots. Distances are measured from the wooden stake on top of which 2lbs of kinesis was brought to explosion.

| | VEGETATION TYPE | | | | | | |
|---|---|---|---|---|---|---|---|
| | H4 | H5 | S2 | S2 | S3 | S3 | M2 |
| | TEST SITE- AND SHOT POINT NUMBER | | | | | | |
| ENVIRONMENTAL FACTORS | TS02 SP?? | TS01 SP81 | TS01 SP04 | TS02 SP01 | TS01 SP75 | TS03 SP?? | TS03 SP41 |
| Number of sampled plots | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Moisture regime | dry | wet | moist | moist | moist | moist | wet |
| Tilting degree and exposure | 0-5;S | 0-5;N | 0 | 0-5;W | 0 | 0-5;W | 0 |
| Estimate of plant cover (%) | 30 | 15 | 19 | 15 | 12 | 32 | 95 |
| Soil texture | sandy silt | sandy silt | silty sand | silt | sandy silt | silty sand | sandy silt |
| Depth of humus layer (cm) | 2 | 1 | 3 | 1 | 1 | 10 | 6 |
| Depth to stone layer (cm) | >20 | >20 | >20 | >20 | 10->20 | >20 | 10->20 |
| Altitude of site (m) | 200 | 500 | 460 | 150 | 490 | 300 | 250 |
| Maximal vegetation hight (cm) | 5 | 3 | 2 | 3 | 2 | 8 | 15 |
| DAMAGING EFFECTS: | | | | | | | |
| Radius where all the vegetation is torn up or killed (cm) | 40 | 34 | 41 | 35 | 17 | 40 | 60 |
| Maximum distance of visible damage to the vegetation (cm) | 190 | 180 | 207 | 185 | 195 | 205 | 175 |
| Maximum thickness of soil removed by the blast (cm) | 2 | 1 | 2 | 1 | 5 | 4 | 11 |

TABLE 9. Vegetation types used in the vegetation mapping program of Jameson Land. The vegetation map will form the basis of a sensitivity map for seismic activities.

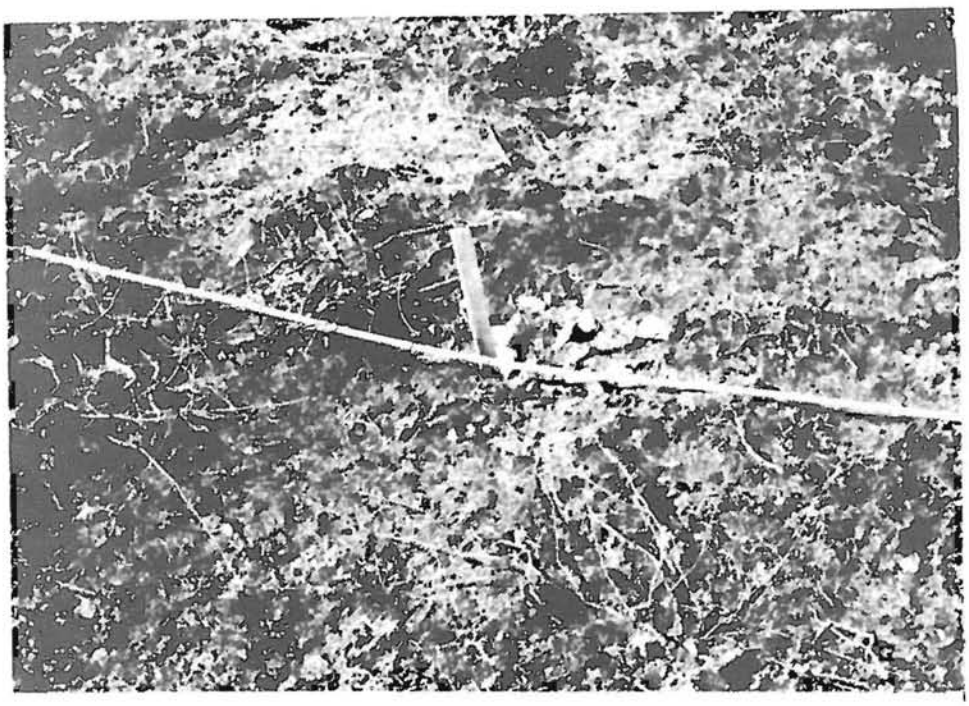
VEGETATION
JAMESON LAND, NE. GREENLAND.

| CODE | IMPORTANT VASCULAR PLANT TAXA | VEGETATION UNIT | TERRAIN |
|---|---|---|---|
| M1 | Carex saxatilis, C. rariflora, Eriophorum scheuchzeri | Graminoid marsh and small ponds | Level ground along streams and lakes |
| M2 | Eriophorum triste, Ranunculus sulphureus, Arctagrostis latifolia | Hummocky meadow | Depressions in heaths and sloping ground |
| G1 | Calamagrostis neglecta, Poa pratensis, Arctagrostis latifolia | Wet grassland | Level ground along streams and lakes |
| G2 | Carex subspathacea, Puccinellia phryganodes, Stellaria humifusa | Salt marsh | Level ground along the coast |
| H2 | Taraxacum spp., Hieracium alpinum, Rhodiola rosea | Herb-slope | Moist south-facing sloping ground below snow drifts |
| H3 | Betula nana, Vaccinium uliginosum, Cassiope tetragona | Moist dwarf scrub, rich in mosses. Vegetation cover exceeding 75% | Level and sloping ground |
| H4 | Cassiope tetragona, Vaccinium ulioginosum, Betula nana | Dry dwarf scrub with vegetation cover between 25-75% | Level and sloping ground |
| H5 | Dryas octopetala, Betula nana, Vaccinium uliginosum | Sparse dwarf scrub | Level and sloping ground |
| H7 | Dryas octopetala, Arctostaphylos alpina, Salix arctica, Silene acaulis | Fell-field : sparse vegetation as a result of desiccation or solifluction | Wind-swept ridges or patterned ground |
| H8 | Dryas octopetala, Arctostaphylos alpina, Salix arctica | Sand dune with open to sparse vegetation | Wind swept ridges on sandy ground |
| T | Salix arctica, Potentilla crantzii | Thicket exceeding 20 centimeters in height | Moist, south-facing slopes |
| S1 | Salix arctica, S. herbacea, Sibbaldia procumbens, Carex scirpoidea | Snowbed : long growth period | Moist, south-facing slopes |
| S2 | Salix arctica, Luzula confusa, Carex lachenalii, Oxyria digyna | Snowbed : short growth period | Slopes with heavy snow cover |
| S3 | Salix arctica, Carex bigelowii, Polygonum viviparum, (Dryas octopetala) | Snowpatch : intermediary growth period | Shallow depressions on level or gently sloping ground |
| I1 | Bare ground, bedrock, stonefields and scree | | |
| I4 | Riverbeds | | |
| I5 | Snow and ice | | |
| L | Water | | |

## 4. CONCLUSIONS

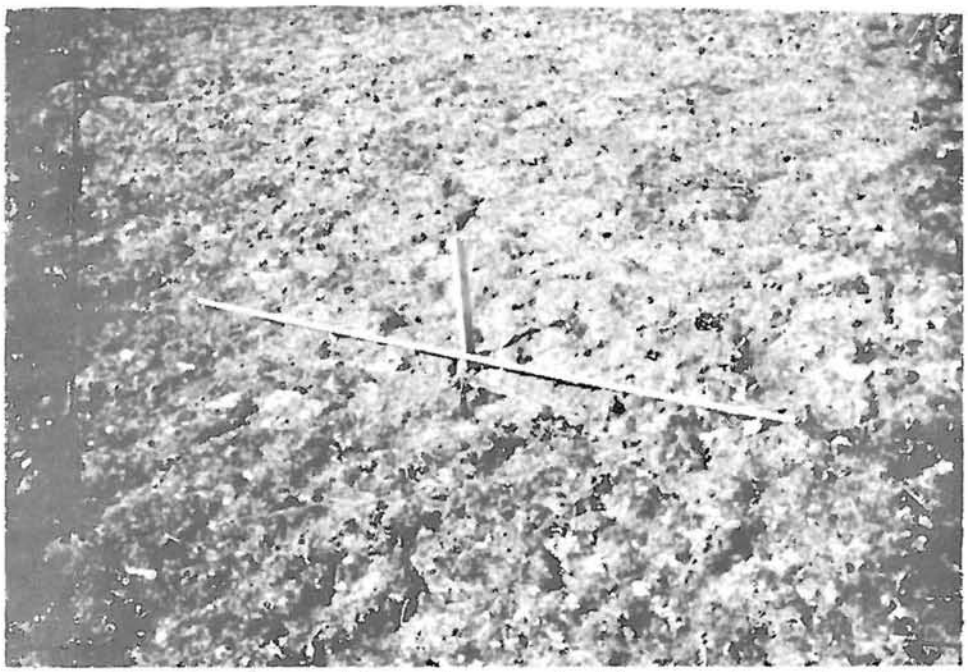
Seismic surface shooting causes killing and damaging of the vegetation in a certain radius from the stakes. The damage from the shooting is variable depending on the charge size, vegetation- and soil- type, the relief of the ground and the moisture content in the soil. On locations with a thick humus layer and a dense vegetational cover such as wet meadows and moist dwarf scrub communities (type M2 and H3), the damaging effect from the seismic shooting has been most severe. Where a humus layer, up to 20cm thick, is based directly on a stone layer, the humus layer is often torn off in a radius more than one metre from the stake. Within this zone only few dead individuals of dwarf shrubs were rooted. This type of damage is common in the luxuriant dwarf scrub (type H3) (Photo 83-091-42).

In an examined tussucky marsh, situated on a former river bed, a similar effect was observed. Here only the vegetation on the exposed sides of the tussocks was killed, whereas the vegetation was intact on the lee sides (Photo 83-043-08). In this marsh community the moss cover was



*Salix arctica - Vaccinium uliginosum - Cassiope tetragona* dwarf scrub after surface shooting. Test site 2, sampling site 15. July 23, 1983. Photo 83-091-42.

torn up within a distance of 85 centimetres from the stake. The total cover of plants was reduced from 100% to less than 10%. However, on locations with a thin or missing humus layer in combination with an open or sparse vegetation, the seismic shooting has generelly caused a limited damage. Vegetation on a silty soil appear to be most resistent to the blast wave (Photo 83-091-40, 83-091-34). The active soil was



Vegetation on micropatterned ground after surface shooting. Test site 2, sampling site 9. July 23, 1983. Photo 83-091-40.

*Cassiope tetragona* dwarf scrub after surface shooting. Test site 2, sampling site 3. July 23, 1983. Photo 83-091-34.

generally undamaged in the open vegetation, where the peat layer is poorly developed.

The species showed different sensitivity to the explotions. Among dwarf shrubs *Salix arctica* is the least vulnerable being the species most often found alive closest to the stake, on an average at the distance of only 60cm.

The other dwarf shrubs (*Vaccinium uliginosum, Cassiope tetragona* and *Dryas octopetala*) are seemingly equally sensitive. No living individuals were found within a distance of 70 - 90cm from the stake. *Betula nana* is the most sensitive of the dwarf shrubs. The maximum damaging effect on the vegetation is usually determined by finding defoliated individuals of *Betula nana* at the greatest distance from the centre of the explosions. This figure is on average 185cm.

Grasses, sedges and herbs with a caespitose growth like *Carex scirpoidea, Carex nardina, Carex glacialis* and *Tofieldia pusilla* are managing much better than the dwarf shrubs. These species are undamaged on a distance of more than 70cm fron the centre, the corresponding figure for dwarf shrub being on an average 130cm.

The degree of cover of higher plants has been reduced remarkably as a result of the surface shooting. Before the explosions average the degree of cover in the sampling site were 22% (*Cassiope tetragona* dwarf scrub), 15% (vegetation on solifluction soil), 5% (micropatterned ground), 10% (*Dryas octopetala* dwarf scrub) and 20% (*Salix arctica - Vaccinium uliginosum - Cassiope tetragona* dwarf scrub) respectively.

The total degree of cover of higher plants in the sampling sites does not exceed 1% in any but one vegetation type after the surface shooting. The exception is the marsh vegetation, where the cover of phanerogams is a couple of percent. This is due to the intact cover on the protected sides of the tussocks.

# UNDERSØGELSER AF VEGETATIONENS FØLSOMHED OVER FOR DIESEL- OG RÅOLIESPILD

(INVESTIGATIONS OF THE EFFECTS OF DIESEL- AND CRUDE OIL SPILLS ON DIFFERENT VEGETATION TYPES)

## 1. Abstract

Crude oil and diesel oil was spilled on five major Mesters Vig plant communities at an intensity of 10 litre per square metre. The communities occurred along a topographic-moisture gradient. The reaction of the major species of the various communities was recorded one year after the spills. Where crude oil was spilled, the phanerogams showed little recovery. The degree of recovery was dependant on the moisture of the plant community. Arctic willow *(Salix arctica)* showed some recovery in all the crude oil test plots, whereas *Dryas octopetala* was killed in the plots where it occurred. Graminoids generally showed slight recovery. In the diesel fuel treated plots *Salix arctica* and *Cassiope tetragona* showed only very slight recovery in respectively 1:4 and 1:3 of the plots where they occurred. Generally most shrubs and all graminoids and forbs were killed by the diesel oil treatment. The mosses showed relatively good recovery during the first year in both crude- and diesel oil treated plots.


FIG.1 The area at Mesters Vig where five communities were treated with crude oil and diesel oil. The sites are marked with numbers on the photograph. (1) extremely dry dwarf scrub - type H4; (2) moist meadow - type M2; (3) moist dwarf scrub - type H3; (4) wet marsh - type M1; (5) dry dwarf scrub - type H4. August 6, 1982. Phot. no. 82-064-06.

## 2. Introduction

Ten oil spill plots were established in 1982 in order to get information on the impact of oil spill on different kinds of vegetation. The methods and the set up of data used follow generally Walker et al. (1978) for comparison purporses. The sensitivity of a landscape to crude oil spills depends on many factors such as time of year, type of spill (e.g. point spill or spray spill), volume, water content of the soil and the species composition of the affected area (Walker et al.). Information on the effect of oil spill on the vegetation in the Jameson Land area is important before an oildrilling, since it will take several years of observations to get a knowledge of the sensitivity of the various ecosystems to oil spills. The test plots were placed close to Mesters Vig for practical reasons. The vegetation at Mesters Vig is very similar to the vegetation in Jameson Land. The information on the sensivity of various ecosystems to oil spill can be combined with to the vegetation maps that are under preparation. This approach can be used for an evaluation of future drill sites and pipelines so that sensitive areas might be avoided.

## 3. Methods

A vegetation map in scale 1:25.000 is under preparation for selected areas in Jameson Land. Some of the data necessary for the derivation of the sensitivity from the vegetation map were acquired by spilling North Sea crude oil and diesel oil on plots within each of the five major plant communities. Diesel oil was included in the experiment since it is likely to be accidently spilled in the area by vehicles etc.. The sites was quadrated on August 8, 1982 at a time when maximum production is reached. Within each of the five communities, crude oil was spilled on one 1 x 1 m plot and diesel fuel was spilled on a similar nearby plot. In one of the crude oil plots only 1/3 sq.m was treated with oil due to insufficient amount of oil. Areas adjacent to the plots were used as control areas. The five communities spanned the topographic-moisture gradient from a dry ridge to a very wet marsh. The dry end of the gradient was dominated by *Dryas octopetala*, *Cassiope tetragona*, *Silene acaulis* and fruticose lichens including *Cetraria delisei* and *C. islandica*. The lower end of the gradient passed through an area dominated by *Carex stans* and the mosses *Scorpidium turgescens* and *Drepanocladus revolvens* covered by 0 - 5 cm of water. Complete quadrat data from the five communities are presented in Table 1. The oil treatment plots were sealed from their lateral surroundings by a poly-

ethylene sheeting inserted 15 to 25 cm below the surface and extending approx. 10 cm above. This was done to confine the hydrocarbon spills to the plots and proved sufficient in all exept the wettest site where the water raised to a level above the sheeting during the summer of 1983. Ten liters of either North Sea crude oil or diesel fuel was applied on August 8, 1982 to all exept one of each 1 x 1 m plot (equivalent to fluid depth of approximately one cm). Photographs were taken of the ten treatment plots before and one year following the spills. The cover of living plants in the spill plots was estimated after one year on August 31, 1983. A Sensitivity Index (SI) was calculated for each community type represented by the spills. This index is the ratio of live plant cover one year following the spill (CR) to the original plant cover before the spill (CT).

## 4. Results

### 4.1 Crude Oil Spills

One year following the spills, most species were dead on the crude oil plots (Table 1a). *Dryas octopetala* was killed in both the sites where it occurred. However, single individuals of *Cassiope tetragona*, *Salix arctica* and *Vaccinium uliginosum* survived on all the sites during the first year although the recovery here was poor. *Salix arctica* showed the highest degree of resistance to the crude oil treatment. The graminoids generally showed very poor recovery from the treatment with crude oil. There is no marked difference in recovery between the dry and the wet sites. All forbs were killed by the crude oil.

A few species showed some degree of apparent recovery one year following the spills. Table 2a lists these species with an evaluation of their success in surviving the oil spills. It is apparent from the table that *Salix arctica* and the monocotyledons showed the highest degree of recovery. There is no generally pronounced difference in recovery between the wet and the dry sites during the first year. Only the very wet *Carex stans* - *Salix arctica* - *Scorpidium turgescens* marsh seems to recover significantly better than the other tested plant communities. The sensitivity to oil spill of plant species with a wide ecological range differs with the plant community in which they grow, and most likely the moisture conditions are the most important factors.

### 4.2 Diesel Oil Spills

There was only little recovery on the diesel spill plots after one year (Table 1b). All graminoids and forbs appeared to be completely dead. Only very little recovery was seen for *Cassiope tetragona* and *Salix arctica*. However, the mosses generally seemed to recover moderately. The lichens appeared generally undamaged but in general it was difficult to determine whether the lichens were live or not. It was impossible to determine the effect of diesel oil on the organic crust during the first year.

## 5. Discussion

At Mesters Vig very few species other than the sedges (Carex spp.) and willow (*Salix* sp.) showed recovery from the oil spills in one year. Fortunately, those which did recover often comprise a large proportion of the vegetation.

Before any firm conclusions regarding the survivability of species can be made, the study plots will have to be observed for several additional seasons. This is true with regard to species which appear to recover after one year but which later die and conversely with those species which appear to be dead but which later recover. In contrast to Prodhoe Bay (Walker et al., 1978) it was not possible to se a pronounced difference in responce to the oiltreated plots between the wet and the dry sites at Mesters Vig during one year. At Prodhoe Bay, the wet vegetation types in general showed a higher recovery potential than the drier types. Further, a correlation between plant growth form and sensitivity to oil spill was found in the Prodhoe Bay study. Such a general correlation is not yet found in the study at Mesters Vig. The sensitivity index as it is used here is a very preliminary measure for the plants ability to recover. At least one additional year is necessary to evaluate the recovery of the single species as well as the entire plant community.

Since the same species react differently to the oil treatment dependent on the type of environment where it occurs, it is necessary to set up some additional test plots in order to cover all common vegetation types in Jameson Land.

Additional oil spill tests have to be established in the future to give information on the sensitivity of snow bed vegetation and a broader spectrum of marsh and meadow vegetations to oil spill.

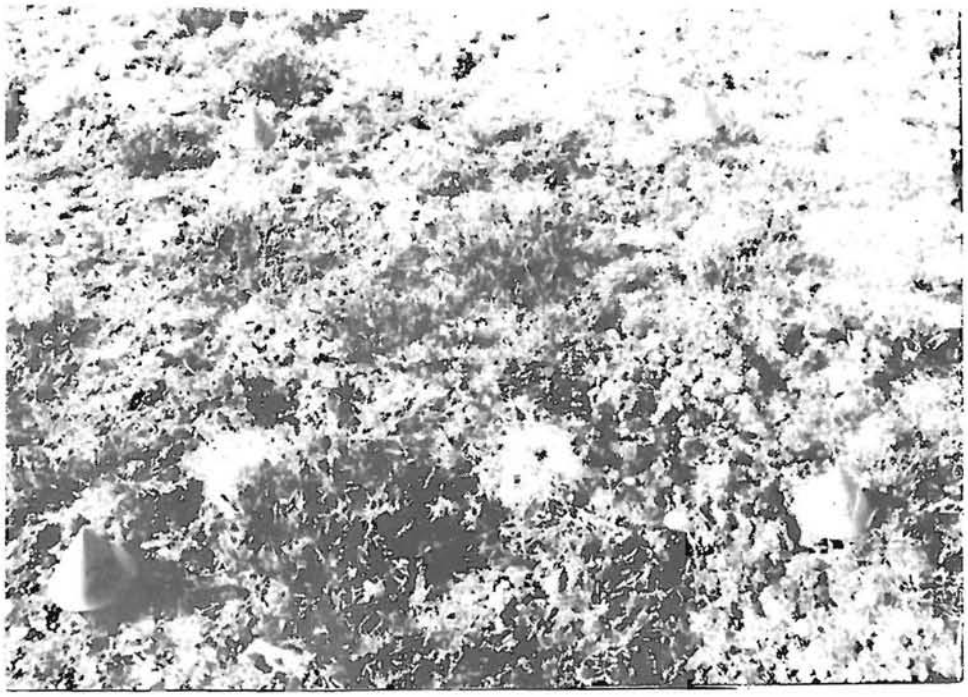


FIG.2 Site no. |22|32|28|24| in the extremely dry dwarf scrub with *Cassiope tetragona*, *Dryas octopetala* and *Carex nardina*. Crude oil was later applied to this site on August 8, 1982. Phot. no. 82-064-07.

FIG.3 Site no. |30|36|31|35| in the moist *Carex bigelowii* meadow (type M2). The plot was sealed from its surroundings by plastic sheeting inserted into the ground. Crude oil was later applied to this site on August 8, 1982. Phot. no. 82-064-12.

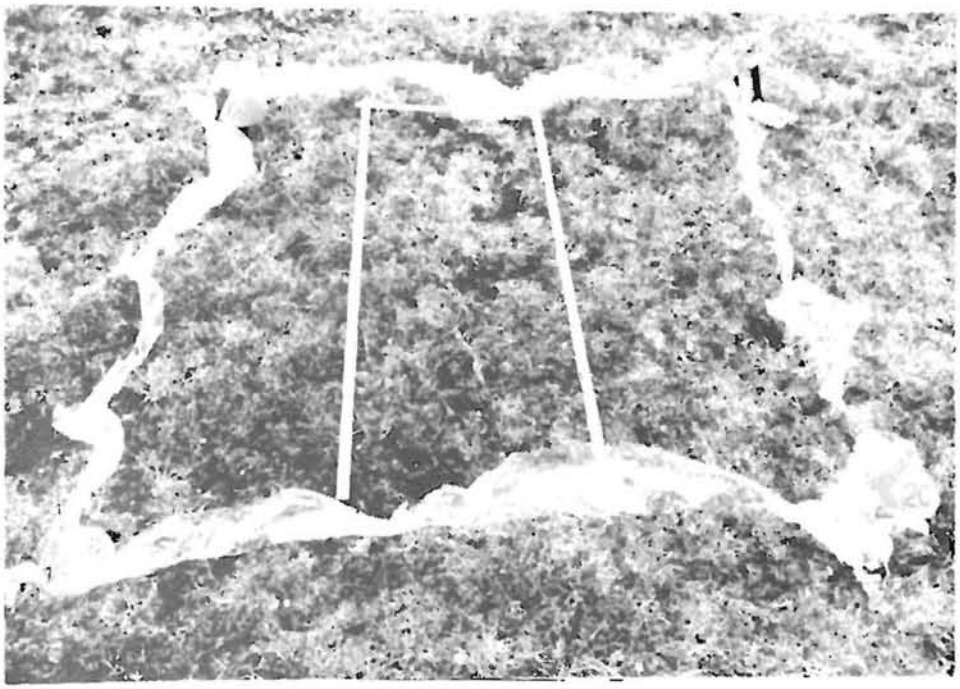


FIG.4 Site no. |20|34|19|18| in a moist dwarf scrub, rich in mosses (type H3). The plot was divided into three parts in which the plant cover was estimated seperately for each. Crude oil was later applied on August 8, 1982. Phot, no. 82-076-04.

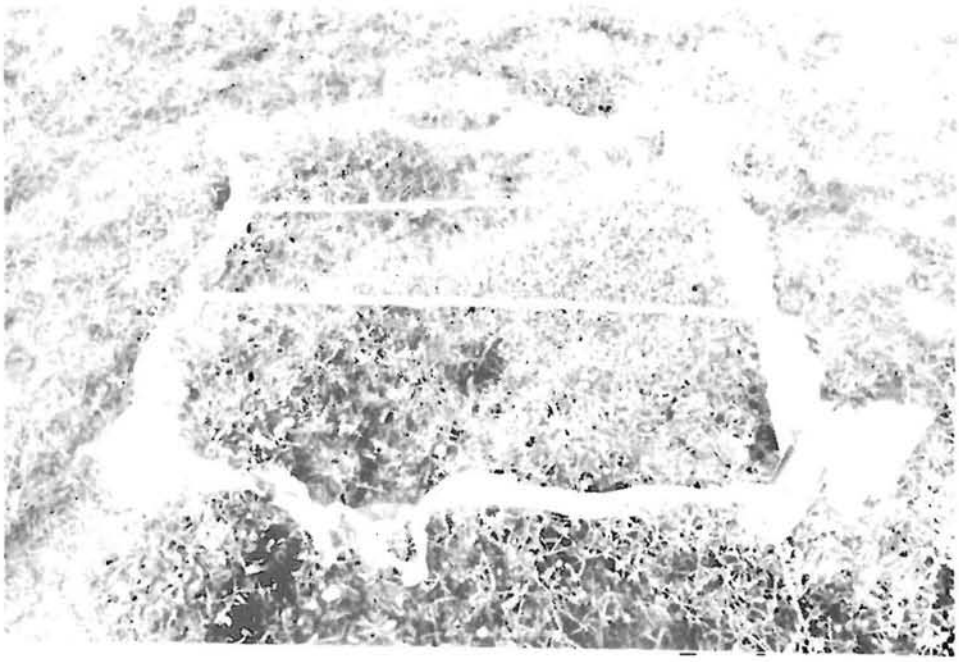


FIG.5 Site no. |39|17|37|13| in a *Carex stand - Salix arctica* wet marsh. The water level was close to the edge of the plastic sheeting. Crude oil was later applied to this site on August 8, 1982. Phot. no. 82-076-07.

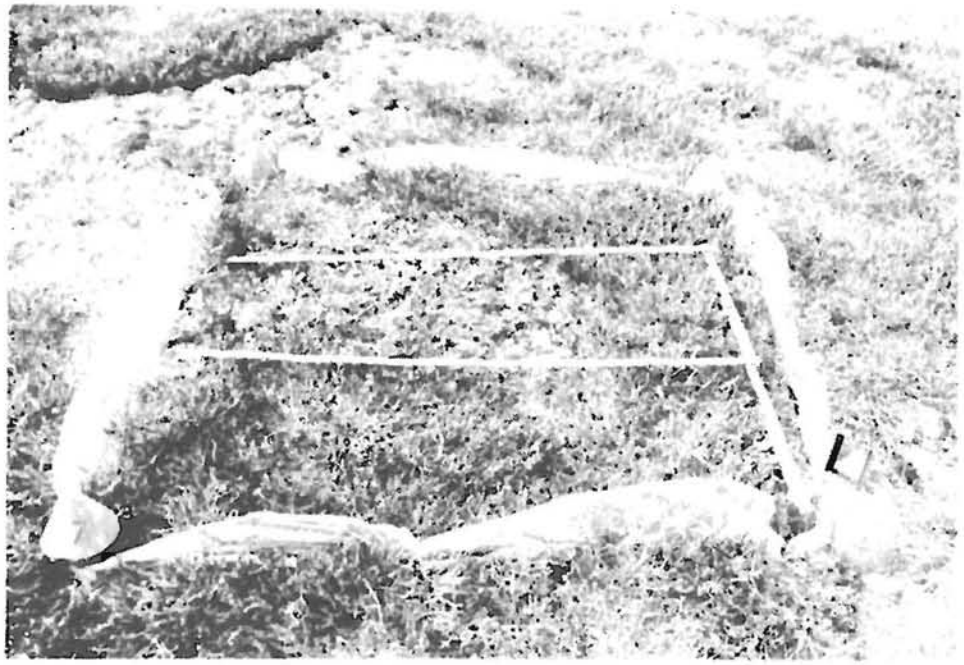


FIG.6 Site no. |07|14|13|04| in a dry *Cassiope tetragona* heath with *Salix arctica*. Crude oil was applied to the most distant 1/3 x 1 metre quadrat seen on the photograph. Crude oil was later applied to this site on August 8, 1982. Phot. no. 82-076-10.

TABLE 1.

Summary of quadrat data from the five treated plant communities (see Table 3 for names). The table shows environmental data for each community found in the plot. For the species, the site columns are divided into 2 parts. The left hand column (labelled X) is the percentage cover before the treatment and this may be regarded as the control value; the right hand column in Table 1a (labelled C ) shows the recovery in the crude oil plot one year after treatment. The table is repeated for treatment with diesel oil (Table 1b). Here the right hand column (labelled D) shows recovery in the diesel oil plot. Percentage cover for all taxa is given for the live fraction only. Recovery for each taxon is given as the percentage cover for the live fraction in the same plot one year after the treatment. (+) indicates species occurring in trace amounts; (|) the species occur in the quadrat, but cover is not estimated separately for the species; (?) recovery questionable.

| Environmental Factors | Plant Community | | | | |
|---|---|---|---|---|---|
| | H4 | M2 | H3 | M1 | H4 |
| Moisture regime | extremely dry | moist | moist | wet | dry |
| Slope degree | 0-5 SW | 0-5 SW | 5-10 SW | 0 | 0 |
| Terrain description | ridge | upper slope | upper slope | depression | unpatterned level ground |
| Estimate of bare soil (%) | <1 | 0 | 0 | 0 | <1 |
| pH of soil in depth of 2 centimetres | 5.5 | 5.5 | 5.7 | 6.2 | 4.7 |
| Soil texture | silty sand | gravely sandy silt | sandy silt | silt | sand |
| Depth of humus layer in centimetres | <1 | >20 | 10 | 8-10 | >20 |
| Altitude of the site in metres | 110 | 100 | 90 | 30 | 40 |
| Maximal vegetation hight in centimetres | 10 | 18 | 10 | 10 | 10 |

TABLE 1a, CRUDE OIL SPILL PLOTS
(See text at Tab. 1 for explanation)

| SPECIES | PLANT COMMUNITY | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | H4 | | M2 | | H3 | | M1 | | H4 | |
| | SITE NUMBERS | | | | | | | | | |
| | 32 - 28 / 22 - 24 | | 36 - 31 / 30 - 35 | | 34 - 19 / 20 - 18 | | 17 - 37 / 39 - 13 | | 14 - 13 / 07 - 04 | |
| | X | C | X | C | X | C | X | C | X | C |
| Shrubs: (total) | 24 | + | 1 | + | 19 | 1 | 18 | 5 | 31 | 1 |
| Cassiope tetragona | 15 | + | | | | | | | 25 | + |
| Dryas octopetala | 7 | 0 | | | 5 | 0 | | | | |
| Salix arctica | 2 | + | 1 | + | .7 | + | 18 | 5 | 6 | 1 |
| Vaccinium uliginosum | | | | | 13 | 1 | | | | |
| Graminoids: (total) | 2 | + | 44 | + | 8 | + | 5 | + | + | + |
| Carex bigelowii | 1 | + | 40 | + | 1 | + | | | | |
| C. capillaris | | | | | 2 | 0 | | | | |
| C. nardina | .7 | + | | | | | | | | |
| C. misandra | .3 | + | 2 | 0 | | | | | | |
| C. rupestris | | | | | 5 | + | | | | |
| C. saxatilis | | | 1 | + | | | | | | |
| C. stans | | | | | | | 5 | + | | |
| Festuca brachyphylla | | | | | | | | | + | 0 |
| Juncus biglumis | | | .7 | 0 | + | 0 | | | | |
| J. castaneus | | | | | + | 0 | | | | |
| J. triglumis | | | .7 | 0 | + | 0 | | | | |
| Luzula confusa | | | | | | | | | + | + |
| Forbs: (total) | 3 | 0 | 1 | 0 | 18 | 0 | 3 | 0 | 0 | 0 |
| Draba sp. | + | 0 | | | | | | | | |
| Equisetum arvense | | | | | | | .3 | 0 | | |
| E. variegatum | | | + | 0 | | | 1 | 0 | | |
| Papaver radicatum | + | 0 | | | | | | | | |
| Pedicularis flammea | | | + | 0 | 2 | 0 | | | | |
| Polygonum viviparum | .7 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | | |
| Saxifraga cernua | + | 0 | | | | | | | | |
| S. foliolosa | | | | | + | 0 | | | | |
| S. oppositifolia | + | 0 | | | 1 | 0 | | | | |
| Silene acaulis | 2 | 0 | | | 14 | 0 | | | | |
| Stellaria longipes s.l. | | | + | 0 | | | | | | |
| Mosses: (total) | 4 | .3 | 73 | 5 | 67 | 2 | 100 | 17 | 30 | 0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Bryum cfr. nitidulum | | | | | | | | | |
| Bryum pseudotriquetrum | | | | | | | | | |
| Bryum sp. | | | | | | | | | |
| Calliergon sarmentosum | | | | | | | | | |
| Campylium stellatum | | | | | | | | | |
| Catoscopium nigritum | | | | | | | | | |
| Dicranum angustum | | | | | | | | | |
| Distichium sp. | | | | | | | | | |
| Drepanocladus revolvens | | | | | | | | | |
| Fissidens osmundioides | | | | | | | | | |
| Meesia uliginosa | | | | | | | | | |
| Myurella julacea | | | | | | | | | |
| Pholia sp. | | | | | | | | | |
| Polytrichastrum alpinum | | | | | | | | | |
| Scorpidium turgescens | | | | | | | | | |
| Tomenthypnum nitens | | | | | | | | | |
| Tortella fragilis | | | | | | | | | |
| Lichens: (total) | 7 | ? | | | | | | 4 | ? |
| Alectoria nigricans | | | | | | | | + | ? |
| Cetraria delisei | 6 | ? | | | | | | | |
| C. islandica | .7 | ? | | | | | | 3 | ? |
| C. nivalis | | | | | | | | 1 | ? |
| Cladonia coccifera | | | | | | | | + | ? |
| Coelocaulon aculeatus | | | | | | | | + | ? |
| Organic crust: | 62 | ? | 5 | ? | 16 | ? | | 28 | ? |
| TOTAL PLANT COVER: | 39 | .3 | 120 | 5 | 112 | 2 | 127 | 22 | 81 | 1 |

TABLE 1b, DIESEL OIL SPILL PLOTS
(See text at Tab. 1 for explanation)

| SPECIES | PLANT COMMUNITY H4 | | M2 | | H3 | | M1 | | H4 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SITE NUMBERS 18 - 20 / 19 - 15 | | 02 - 25 / 23 - 29 | | 10 - 06 / 05 - 11 | | 01 - 03 / 33 - 05 | | 08 - 12 / 10 - 17 | |
| | X | D | X | D | X | D | X | D | X | D |
| Shrubs: (total) | 47 | 0 | 1 | 0 | 28 | 0 | 10 | + | 34 | + |
| Arctostaphylos alpina | | | | | 4 | 0 | | | | |
| Cassiope tetragona | 21 | 0 | | | 1 | 0 | | | 28 | + |
| Dryas octopetala | 23 | 0 | | | 9 | 0 | | | + | 0 |
| Salix arctica | 3 | 0 | 1 | 0 | | | 10 | + | 5 | 0 |
| Vaccinium uliginosum | | | | | 14 | 0 | | | | |
| Graminoids: | .3 | 0 | 45 | 0 | 4 | 0 | 11 | 0 | .3 | 0 |
| Carex bigelowii | | | 37 | 0 | 1 | 0 | | | | |
| C. capillaris | | | | | .3 | 0 | | | | |
| C. nardina | .3 | 0 | | | | | | | | |
| C. misandra | | | 2 | 0 | | | | | .3 | 0 |
| C. rupestris | | | + | 0 | 2 | 0 | | | | |
| C. saxatilis | | | 2 | 0 | | | | | | |
| C. scirpoidea | | | .7 | 0 | .3 | 0 | | | | |
| C. stans | | | | | | | 11 | 0 | | |
| Eriophorum scheuchzeri | | | | | | | + | 0 | | |
| Juncus biglumis | | | + | 0 | | | | | | |
| J. castaneus | | | .3 | 0 | | | | | | |
| J. triglumis | | | .3 | 0 | + | 0 | | | | |
| Forbs and Pteridophytes | 1 | 0 | 2 | 0 | 15 | 0 | 2 | 0 | 4 | 0 |
| Chamaenerion latifolium | | | .3 | 0 | | | | | | |
| Equisetum variegatum | | | | | | | 1 | 0 | | |
| Huperzia selago | | | | | | | | | + | 0 |
| Koenigia islandica | | | + | 0 | | | | | | |
| Minuartia stricta | | | + | 0 | | | | | | |
| Oxyria digyna | | | | | | | | | + | 0 |
| Pedicularis flammea | | | .3 | 0 | 2 | 0 | | | | |
| Polygonum viviparum | .3 | 0 | 1 | 0 | .7 | 0 | 1 | 0 | .3 | 0 |
| Saxifraga cernua | | | | | | | | | + | 0 |
| S. foliolosa | | | + | 0 | | | | | | |
| S. oppositifolia | .3 | 0 | | | 1 | 0 | | | 3 | 0 |
| Silene acaulis | .6 | 0 | | | 11 | 0 | | | 1 | 0 |
| Mosses: (total) | 1 | + | 77 | 6 | 60 | 13 | 100 | 6 | 37 | 19 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Bryum cfr. nitidulum | | | \| | | | | | | |
| Bryum pseudotriquetrum | | | | | | \| | | | |
| Calliergon sarmentosum | | | | | | \| | | | |
| Campylium stellatum | | | | | \| | \| | | | |
| Dicranum angustum | \| | \| | | | | | | \| | |
| Distichium sp. | | | \| | | | | | | | |
| Drepanocladus revolvens | | | \| | | \| | \| | | | |
| Fissidens osmundioides | | | \| | | | | | | | |
| Meesia uliginosa | | | \| | | | | | | | |
| Myurella julacea | | | | | | | | | | |
| Philonotis tomentella | | | | | | \| | | | |
| Polytrichastrum alpinum | | | \| | | | | | | \| | |
| Saelania glaucescens | | | | | | | | | \| | |
| Tomenthypnum nitens | | | | | \| | | | | | |
| Tortella fragilis | | | \| | | \| | | | | \| | |
| Lichens: (total) | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | ? |
| Cetraria delisei | 3 | 2 | | | | | | | | |
| C. islandica | .6 | .6 | | | | | | | 8 | 5 |
| C. nivalis | + | + | | | | | | | .7 | .7 |
| Stereocaulon alpinum | | | | | | | | | .7 | ? |
| Organic crust: | 45 | ? | 36 | ? | 8 | ? | | | 3 | ? |
| Bare ground: | 6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL PLANT COVER: | 53 | 3 | 122 | 6 | 105 | 13 | 123 | 6 | 85 | 25 |

TABLE 2a. Summary of species recovery on the crude oil spill plots one year following treatment. All other species listed in Table 1a were apparently killed by the treatment.

| Growth-form | Species | Degree of Recovery |
|---|---|---|
| Evergreen shrubs | Cassiope tetragona | Slight - only few of the shoot apexes showing new growth |
| Deciduous shrubs | Salix arctica | Moderate to good - plants small but shoots frequently from the stem bases |
| Monocotyledons | Carex bigelowii | Moderate - plants showing new growth, but phenologically much slower |
| | C. nardina | Moderate - plants showing new growth, but phenologically much slower |
| | C. misandra | Slight - only one individual shows new growth |
| | C. rupestris | Slight - only few individuals show new growth |
| | C. saxatilis | Good - most individuals show new growth |
| | C. stans | Moderate - several individuals showing new growth |
| | Luzula confusa | Excellent - but observations include only a few individuals |
| Mosses | | Slight to moderate - the recovery has not been estimated species specificly |
| Lichens | Cetraria delisei | ? - possibly recovering, upper parts of thalli are free of oil |
| | C. islandica | ? - possibly recovering, upper parts of thalli are free of oil |
| | C. nivalis | ? - possibly recovering, upper parts of thalli are free of oil |

TABLE 2b. Summary of species recovery on the diesel oil spill plots one year following treatment. All other species listed in Table 1b were apparently killed by the treatment.

| Growth-form | Species | Degree of Recovery |
|---|---|---|
| Evergreen shrubs | Cassiope tetragona | Slight - only recovery in one of three test sites |
| Deciduous shrubs | Salix arctica | Slight - only recovery in one of three test sites |
| Mosses | | Moderate - recovery has not been estimated species specificly |
| Lichens | Cetraria delisei | ? - possibly recovering |
| | C. islandica | ? - possibly recovering |
| | C. nivalis | ? - possibly recovering |
| | Stereocaulon alpinum | ? - possibly recovering |

TABLE 3a. Sensitivity indices for five of the major Jameson Land stand types treated with crude oil. Values were obtained from quadrat data for the community types; N = number of sampled 1 x 1 m plots, CT = mean percentage total cover, CR = mean percentage cover of plants that have recovered during the first year, SI = sensitivity index (CR/CT). The value before the fraction line is for the phanerogams only, the value after the fraction line includes mosses.

| Map Code | Community | N | CT | CR | SI |
|---|---|---|---|---|---|
| H4 | VERY DRY Dryas octopetala - Cassiope tetragona DWARF SCRUB on a wind-swept ridge | 1 | 29/39 | 1/.3 | .03/.01 |
| H4 | DRY Cassiope tetragona - Salix arctica DWARF SCRUB on level ground | 1/3 | 32/81 | 2/1 | .06/.01 |
| H3 | MOIST Vaccinium uliginosum - Dryas octopetala DWARF SCRUB on 5-10 degree sloping ground | 1 | 45/112 | 2/2 | .04/.02 |
| M2 | WET Carex bigelowii - C. saxatilis SEDGE MEADOW on 5-10 degree sloping ground | 1 | 46/120 | 1/5 | .00/.04 |
| M1 | VERY WET Carex stans - Salix arctica - Scorpidium turgescens MARSH | 1 | 26/127 | 6/22 | .23/.17 |

TABLE 3b. Sensitivity indices for five of the major Jameson Land stand types treated with diesel oil. Values were obtained from quadrat data for the community types; N = number of sampled 1 x 1 m plots, CT = mean percentage total cover, CR = mean percentage cover of plants that have recovered during the first year, SI = sensivity index (CR/CT). The value before the fraciton line is for the phanerogams only, the value after the fraction line includes mosses.

| Map Code | Community | N | CT | CR | SI |
|---|---|---|---|---|---|
| H4 | VERY DRY Dryas octopetala - Cassiope tetragona DWARF SCRUB on a wind-swept ridge | 1 | 48/53 | 0/3 | .00/.06 |
| H4 | DRY Cassiope tetragona - Salix arctica DWARF SCRUB on level ground | 1 | 38/85 | .5/25 | .01/.29 |
| H3 | MOIST Vaccinium uliginosum - Dryas octopetala DWARF SCRUB on 5-10 degree sloping ground | 1 | 95/105 | 0/13 | .00/.12 |
| M2 | WET Carex bigelowii - C. saxatilis SEDGE MEADOW on 5-10 degree sloping ground | 1 | 48/122 | 0/6 | .00/.05 |
| M1 | VERY WET Carex stans - Salix arctica - Scorpidium turgescens MARSH | 1 | 23/123 | .5/6 | .02/.05 |

TABLE 4. Vegetation types used in the vegetation mapping program of Jameson Land. The vegetation map will form the basis of an oil spill sensitivity map.

VEGETATION
JAMESON LAND, NE. GREENLAND.

| CODE | IMPORTANT VASCULAR PLANT TAXA | VEGETATION UNIT | TERRAIN |
|---|---|---|---|
| M1 | Carex saxatilis, C. rariflora, Eriophorum scheuchzeri | Graminoid marsh and small ponds | Level ground along streams and lakes |
| M2 | Eriophorum triste, Ranunculus sulphureus, Arctagrostis latifolia | Hummocky meadow | Depressions in heaths and sloping ground |
| G1 | Calamagrostis neglecta, Poa pratensis, Arctagrostis latifolia | Wet grassland | Level ground along streams and lakes |
| G2 | Carex subspathacea, Puccinellia phryganodes, Stellaria humifusa | Salt marsh | Level ground along the coast |
| H2 | Taraxacum spp., Hieracium alpinum, Rhodiola rosea | Herb-slope | Moist south-facing sloping ground below snow drifts |
| H3 | Betula nana, Vaccinium uliginosum, Cassiope tetragona | Moist dwarf scrub, rich in mosses. Vegetation cover exceeding 75% | Level and sloping ground |
| H4 | Cassiope tetragona, Vaccinium ulioginosum, Betula nana | Dry dwarf scrub with vegetation cover between 25-75% | Level and sloping ground |
| H5 | Dryas octopetala, Betula nana, Vaccinium uliginosum | Sparse dwarf scrub | Level and sloping ground |
| H7 | Dryas octopetala, Arctostaphylos alpina, Salix arctica, Silene acaulis | Fell-field : sparse vegetation as a result of desiccation or solifluction | Wind-swept ridges or patterned ground |
| H8 | Dryas octopetala, Arctostaphylos alpina, Salix arctica | Sand dune with open to sparse vegetation | Wind swept ridges on sandy ground |
| T | Salix arctica, Potentilla crantzii | Thicket exceeding 20 centimeters in height | Moist, south-facing slopes |
| S1 | Salix arctica, S. herbacea, Sibbaldia procumbens, Carex scirpoidea | Snowbed : long growth period | Moist, south-facing slopes |
| S2 | Salix arctica, Luzula confusa, Carex lachenalii, Oxyria digyna | Snowbed : short growth period | Slopes with heavy snow cover |
| S3 | Salix arctica, Carex bigelowii, Polygonum viviparum, (Dryas octopetala) | Snowpatch : intermediary growth period | Shallow depressions on level or gently sloping ground |
| I1 | Bare ground, bedrock, stonefields and scree | | |
| I4 | Riverbeds | | |
| I5 | Snow and ice | | |
| L | Water | | |

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## 7. References

Walker, D.A., Webber, P.J., Everett, K.R. and Brown J. (1978). Effects of Crude and Diesel Oil Spills on Plant Communities at Prudhoe Bay, Alaska, and the Derivation of Oil Spill Sensitivity Maps. Arctic (31)3:242-259.

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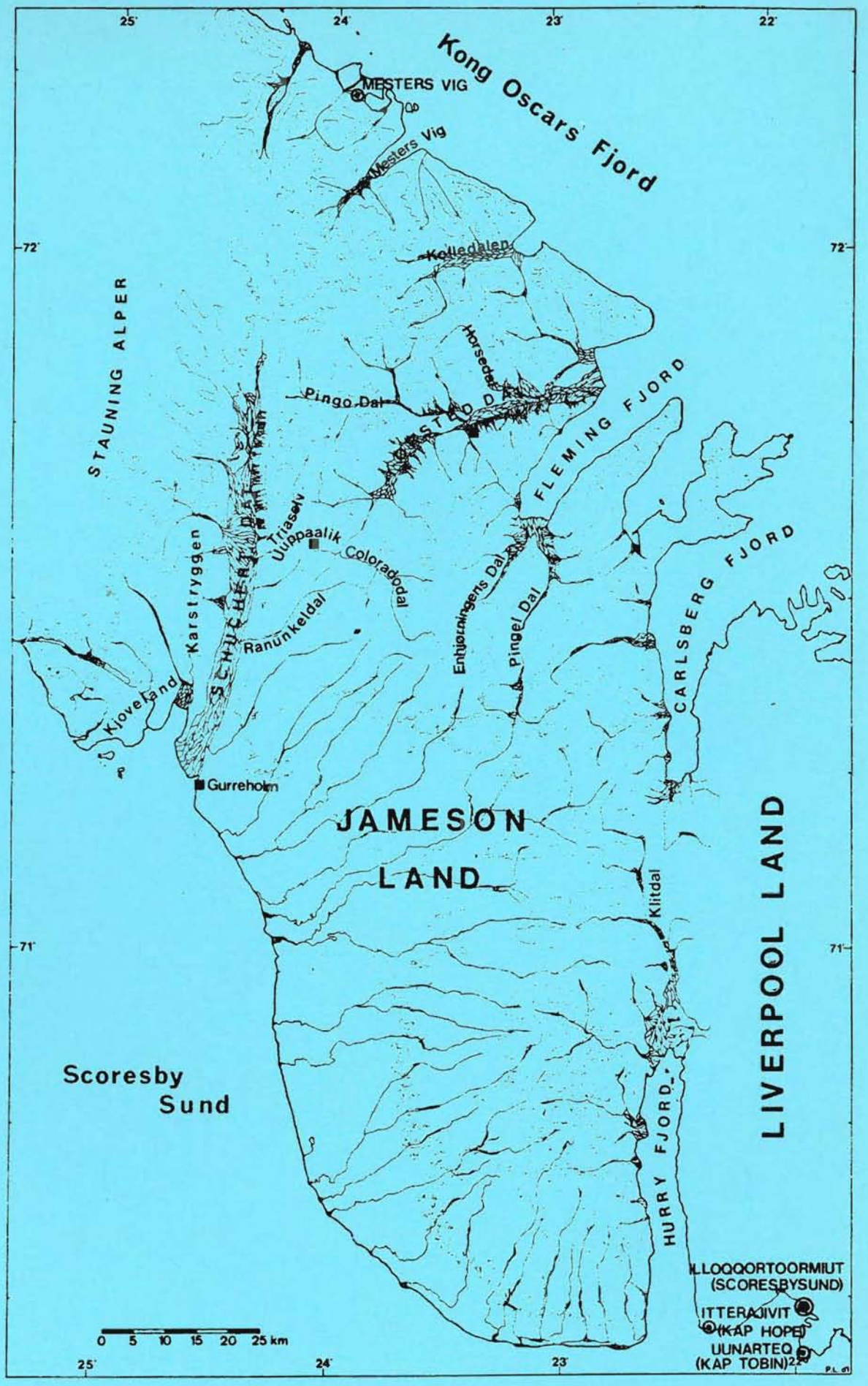


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