

Arctic System Science Flux Study
Data Report

**HAPPY VALLEY
PERMANENT VEGETATION PLOTS**

Site factors, physical and chemical soil properties,
plant species cover, photographs, soil
descriptions, and ordination



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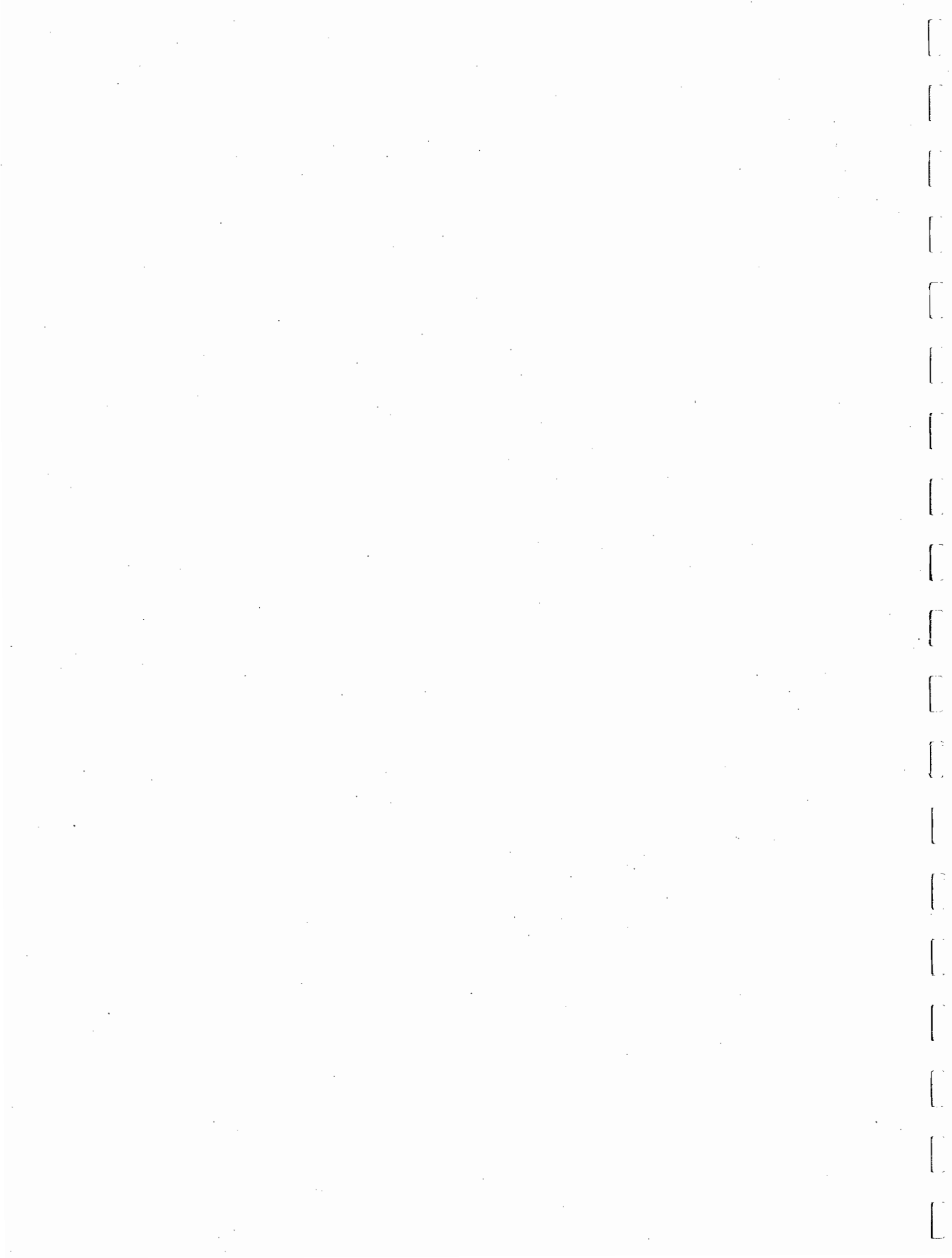


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Introduction

This data report is a summary of environmental, soil and vegetation information collected from 55 relevé plots at the Happy Valley research site along the Sagavanirktok river, located at 69°14'N, 148°50'W in northern Alaska. Figure 1 shows the location of the relevés at Happy Valley. The report brings together all the available information collected from the plots, as well as offering a basic analysis of the communities. This information can be used to further investigate plant community classification, and environmental relationships.

Methods

Reconnaissance survey, sampling dates, and plot locations

A reconnaissance survey was conducted prior to sampling to define the primary vegetation types of Happy Valley, and a total of 18 vegetation types were defined (Table 1). Formal relevé sampling for the plots in this data report was done during the period July 18-27, 1994. An attempt was made to sample at least three relevés for each of the preliminary vegetation types defined, but this was not always possible. Each relevé was described based on the dominant plant species identified (Tables 1 and 2).

The relevés were located in homogeneous areas of vegetation using the centralized replicate method of the Braun-Blanquet approach to vegetation classification (Mueller-Dombois and Ellenberg, 1974; Westhoff and van der Maarel, 1978).

All the relevés are permanently marked with a 4-foot black and white-striped 1-inch PVC pipe. The relevé number is stamped into an aluminum tag at the top of the post.

Sampling

Relevé size, species cover estimation, and photographs

The relevés have no fixed size because our main objective was to obtain a complete species list for each relevé.

Photographs were taken of each relevé (see Appendix). Usually photos were taken of 1) landscape view of the site, 2) close-up of the vegetation, and 3) close-up of the soil profile.

Site factors

The site of each relevé was described according to the variables listed in sample site description sheet (Table 3) plus thaw depth measurements, estimates of cover of bare soil, rocks, the height of vegetation, and the major plant growth forms shown in the sample relevé sheet (Table 4). These data are summarized in Table 5 and 6.

Soils

Field sampling

Soil pits were dug adjacent to the relevés and described and classified according to the U.S. soil taxonomy [Soil Survey Staff, 1975]. Soil samples were collected from each horizon and air dried in the laboratory. Bulk density and soil moisture samples were taken from the sides of the soil pits or from large solid plugs for the wet soils using a 240-ml soil can.

Laboratory analysis

Laboratory analyses were conducted at the Colorado State University Soil Testing Laboratory, Fort Collins. The laboratory's routine analysis was run on all samples [pH (saturated paste); electric current; $\text{NO}_3\text{-N}$, (KCL extract); P, K, Zn, Fe, Cu, Mn, (NH_4HCO_3 -DPTA extract); lime estimate; texture estimate (by hand); organic matter (Walkley-Black or ash method); and Sodium Adsorption Ratio]. Selected samples were analyzed for percent sand, percent silt and percent clay; and Ca, Mg, Na, K (NH_4OAc extract). These methods are described in Page et al. (1982) and Klute (1986). The soils data are in Table 7.

Vegetation

Plant communities were determined and sample plots were marked with stakes. The area surrounding each plot marker was searched until no new species in the plant community being sampled were encountered. Estimates of vegetation cover used the Braun-Blanquet cover-abundance scale (r = rare; + = common but less than 1%; 1 = 1-5%; 2 = 6-25%; 3 = 25-50%; 4 = 51-75%; 5 = 76-100%). Cover abundance values are relatively broad subjective classes, and were determined by estimating cover within the general area of the stake. Voucher collections were made for all vascular plants, bryophytes, and lichens occurring in the relevé. Unknown collections were identified and known collections were verified as follows: Bryophytes by Dr. Olga Afonina; liverworts by Dr. Alexey Potemkin; and lichens by Dr. Mikhail Zhurbenko all at the Komarov Botanical Institute, St. Petersburg, Russia. Table 8 contains the species cover raw data.

Ordination

We used Detrended Correspondence Analysis (DCA) ordination (Hill, M.O. and H.G. Gauch, 1980). Species were weighted equally and detrended by segments. Three aquatic samples (HV-3, 46, and 48), one wet sedge tundra (HV-9), and one frost scar plot (HV-42b) were excluded from the ordination. These relevés are so dissimilar in species composition that when included, slight differences between other community types were difficult to distinguish in the ordination space. The ordination displays relevés in a two dimensional space according to their species similarity. Environmental variables were related to the ordination axes with a biplot diagram. The biplot diagram indicates the strength of correlations for significantly correlated environmental variables (Dargie, 1984; Jongman et al., 1987).

Results from the ordination capture three significant environmental variables that affect variation in the vegetation composition, stability, exposure and soil moisture (Figure 2). Relevés that occur in preliminary classifications also occur in recognizable clusters in the ordination space.

Acknowledgments

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Figure 1. Location of relevés at Happy Valley

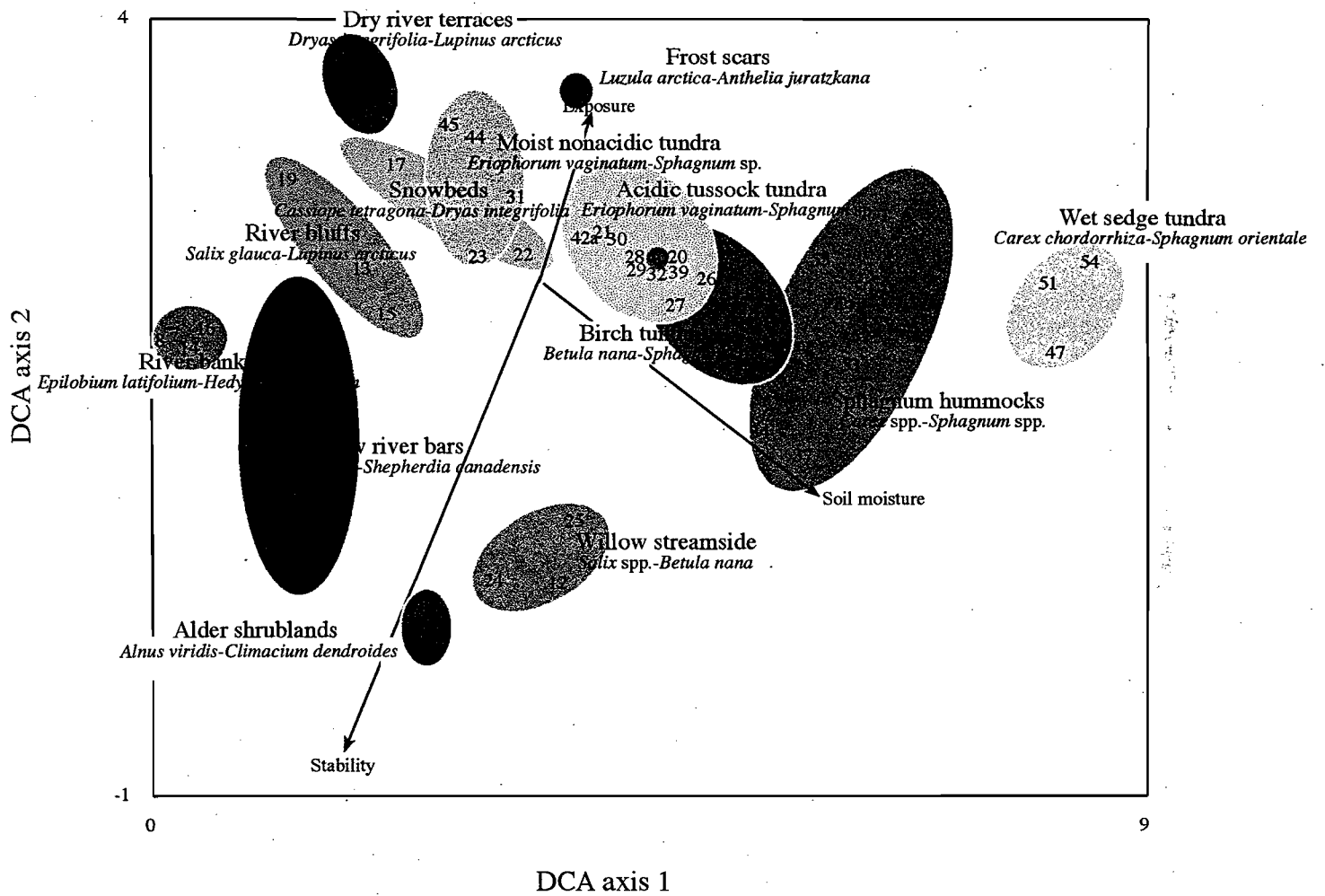


Figure 2. Detrended Correspondence Analysis (DCA) ordination of Happy Valley vegetation relevés. Extreme relevés (HV-3, 46, 48, 9, 42b) were excluded because species composition was too dissimilar with other plots. Colors indicate preliminary community types.

Table 1. Preliminary vegetation classification based on habitat and dominant species and sample numbers for each type

<u>Principal Habitat</u>	<u>Preliminary Community name</u>	<u>Relevés</u>
<i>Dry tundra</i>		
Dry river terraces	<i>Dryas integrifolia-Lupinus arcticus</i>	HV-1, 2, 6, 10,
Partially vegetated river banks	<i>Epilobium-latifolium-Hedysarum alpinum</i>	HV-7, 8, 14, 16
Frost scars	<i>Luzula arctica-Anthelia juratzkana</i>	HV-41, 42b
<i>Snowbeds</i>		
Nonacidic snowbeds	<i>Cassiope tetragona-Dryas integrifolia</i>	HV-17, 22
<i>Moist tundra</i>		
Acidic tussock tundra	<i>Eriophorum vaginatum-Sphagnum</i> sp.	HV-20, 21, 26-30, 32 39, 42a
Moist nonacidic tundra	<i>Carex bigelowii-Tomentypnum nitens</i>	HV-23, 31, 44, 45
<i>Shrublands</i>		
Alder riparian shrubland	<i>Alnus viridis-Climacium dendroides</i>	HV-4, 5
Willow river bars	<i>Salix alaxensis-Shepherdia canadensis</i>	HV-11, 18, 43
Birch-willow streamside	<i>Salix</i> spp.- <i>Betula nana</i>	HV-12, 24, 25
River bluffs	<i>Salix glauca-Lupinus arcticus</i>	HV-13, 15, 19
Birch tundra	<i>Betula nana-Sphagnum</i> sp.	HV-33, 35, 36, 38, 40
<i>Wet tundra</i>		
Wet sedge tundra	<i>Carex aquatilis-Eriophorum angustifolium</i>	HV-9
Wet sedge tundra	<i>Carex chordorrhiza-Sphagnum orientale</i>	HV-47, 51, 54
Sphagnum hummocks	<i>Carex</i> spp.- <i>Sphagnum</i> spp.	HV-34, 37, 49, 50, 52, 53, 55
Deeper water ponds	<i>Comarum palustre-Sparganium hyperboreum</i>	HV-3
	<i>Menyanthes trifoliata</i>	HV-46
	<i>Arctophila fulva</i>	HV-48

Table 2. List of vegetation communities and sites sampled in 1994.

<u>Relevé no</u>	<u>Plant Community</u>	<u>Site</u>
HV-1	Dry <i>Dryas integrifolia</i> , <i>Arctous rubra</i> , <i>Salix glauca</i> , <i>Lupinus arcticus</i> dwarf-shrub, forb tundra	Fluvial terrace between runway and road.
HV-2	Dry <i>Dryas integrifolia</i> , <i>Lupinus arcticus</i> , <i>Rhododendron lapponicum</i> , <i>Cetraria cucullata</i> dwarf-shrub tundra	Fluvial terrace, nearer to road than runway.
HV-3	Aquatic <i>Comarum palustre</i> , <i>Sparganium hyperboreum</i> , <i>Calliergon giganteum</i> forb marsh	Small pond, 100 m east of Dalton highway, just north of Happy Valley camp.
HV-4	Moist <i>Alnus viridis</i> , <i>Salix lanata</i> , <i>Equisetum arvense</i> , <i>Climacium dendroides</i> low-shrub tundra	Floodplain, 150 m west of runway near Happy Valley camp.
HV-5	Moist <i>Alnus viridis</i> , <i>Salix lanata</i> , <i>Vaccinium vitis-idaea</i> low shrubland (riparian)	Floodplain on creek, very shrubby, 200 m west of runway, bottom of hill below road.
HV-6	Dry <i>Dryas integrifolia</i> , <i>Lupinus arcticus</i> , <i>Tomentypnum nitens</i> dwarf-shrub, forb tundra	Fluvial terrace 100 m west of runway across Dalton highway from Happy Valley camp.
HV-7	Dry <i>Epilobium latifolium</i> , <i>Hedysarum alpinum</i> , <i>Salix alaxensis</i> forb, barren tundra	Rocky river bar.
HV-8	Dry <i>Castilleja caudata</i> , <i>Hedysarum alpinum</i> forb, barren tundra	Rocky floodplain.
HV-9	Wet <i>Carex saxatilis</i> , <i>Carex aquatilis</i> graminoid meadow	Edge of pond by gravel pad.
HV-10	Dry <i>Dryas integrifolia</i> , <i>Arctous rubra</i> , <i>Rhododendron lapponicum</i> , <i>Lupinus arcticus</i> dwarf-shrub, forb tundra	Fluvial terrace, near old camp.
HV-11	Dry <i>Salix alaxensis</i> , <i>Shepherdia canadensis</i> , <i>Arctous rubra</i> tall shrubland (riparian)	Tall shrub floodplain with stabilized alluvium.
HV-12	Wet <i>Salix planifolia</i> , <i>Petasites frigidus</i> , <i>Equisetum arvense</i> low-shrub tundra	Water track on shoulder of bluff overlooking Sagavanirktok river, 2 km south of camp.
HV-13	Moist <i>Salix glauca</i> , <i>Salix lanata</i> , <i>Arctous rubra</i> , <i>Lupinus arcticus</i> , <i>Hylocomium splendens</i> forb, low-shrub tundra	Bluff overlooking Sagavanirktok river, 0.5 km north of access road, 2 km south of camp.
HV-14	Dry <i>Salix alaxensis</i> , <i>Castilleja caudata</i> , <i>Hedysarum alpinum</i> low-shrub, forb tundra	Rocky floodplain of Sagavanirktok river. 0.5 km north of access road, 2 km south of camp.
HV-15	Moist <i>Salix lanata</i> , <i>Salix glauca</i> , <i>Arctous rubra</i> , <i>Abietinella abietina</i> low-shrub tundra	Bluff overlooking Sagavanirktok river, north of access road, 2 km south of camp.

- HV-16 Dry *Castilleja caudata*, *Hedysarum alpinum*, *Salix alaxensis* forb tundra
Rocky floodplain on Sagavanirktok river, north of access road, near Peregrine nest, 2 km south of camp.
- HV-17 Moist *Tomentypnum nitens*, *Dryas integrifolia*, *Cassiope tetragona*, *Lupinus arcticus*, dwarf-shrub, forb tundra (snowbed)
Snowbed on bluff overlooking Sagavanirktok river, south of access road.
- HV-18 Moist *Salix alaxensis*, *Salix lanata*, *Tomentypnum nitens*, *Equisetum arvense*, *Hedysarum alpinum* low-shrub tundra
Floodplain, south of access road, stabilized soil.
- HV-19 Dry *Salix glauca*, *Arctous rubra*, *Festuca altaica*, *Hedysarum alpinum*, *Abietinella abietina* shrubland
River bluff overlooking Sagavanirktok river, south of access road.
- HV-20 Moist *Sphagnum* sp. *Hylocomium splendens*, *Eriophorum vaginatum*, *Betula nana* tussock-graminoid, dwarf-shrub tundra
South hill crest of toposequence, 1 km north of Happy Valley camp.
- HV-21 Moist *Hylocomium splendens*, *Carex bigelowii*, *Eriophorum vaginatum*, *Salix planifolia* tussock-graminoid, dwarf-shrub tundra
South shoulder of toposequence, 1 km north of Happy Valley camp.
- HV-22 Moist *Cassiope tetragona*, *Dryas integrifolia*, *Salix glauca*, *Betula nana*, *Vaccinium uliginosum*, *Drepanocladus* sp., *Hylocomium splendens*, *Ptilidium ciliare* dwarf-shrub tundra
Side slope of north-facing toposequence, 1 km north of camp- snowbed.
- HV-23 Moist *Tomentypnum nitens*, *Dryas integrifolia*, *Equisetum arvense*, *Salix glauca* horsetail, low-shrub tundra
Foot slope on north-facing toposequence, 1 km from Happy Valley camp.
- HV-24 Moist *Salix lanata*, *Equisetum arvense*, *Petasites frigidus*, *Dodecatheon frigidum*, *Climacium dendroides* low-shrub tundra (riparian)
Toeslope of toposequence, 1 km north of Happy Valley camp.
- HV-25 Moist *Salix planifolia*, *Betula nana*, *Petasites frigidus*, *Sphagnum squarrosum* low-shrub tundra (riparian)
Shrubby floodplain, north of creek, south-facing toposequence 1 km west of Happy Valley camp.
- HV-26 Moist *Eriophorum vaginatum*, *Betula nana*, *Ledum palustre*, *Sphagnum girgensohnii* tussock-graminoid, dwarf-shrub tundra
Foot slope, south-facing toposequence, 1 km north of Happy Valley camp, 400 m west of Dalton Highway.
- HV-27 Moist *Betula nana*, *Salix planifolia*, *Eriophorum vaginatum*, *Sphagnum angustifolium*, *Aulacomnium turgidum* dwarf-shrub, tussock-graminoid tundra
Side slope of south-facing toposequence 1 km north of Happy Valley camp, 400 m from Dalton Highway.
- HV-28 Moist *Eriophorum vaginatum*, *Betula nana*, *Salix planifolia*, *Aulacomnium turgidum*, *Hylocomium splendens*, *Sphagnum* sp. dwarf-shrub, tussock-graminoid tundra
Side slope of south-facing toposequence, 1 km north of Happy Valley camp, 400 m from Dalton Highway.

- HV-29 Moist *Eriophorum vaginatum*, *Betula nana*, *Salix planifolia*, *Sphagnum* sp., *Aulacomnium turgidum* tussock-graminoid, dwarf-shrub tundra South-facing toposequence 1 km north of Happy Valley, 400 m west of Dalton Highway.
- HV-30 Moist *Carex bigelowii*, *Eriophorum vaginatum*, *Betula nana*, *Petasites frigidus*, *Arctagrostis latifolia*, *Hylocomium splendens*, *Sphagnum* sp. tussock-graminoid, dwarf-shrub tundra Hill crest of south-facing toposequence, 1 km north of Happy Valley camp, 400 m west of Dalton Highway.
- HV-31 Moist *Carex bigelowii*, *Tomentypnum nitens*, *Dryas integrifolia*, *Salix glauca*, *Cetraria cucullata* graminoid, dwarf-shrub tundra Hillslope, 300 m west of Happy Valley camp, 25 m northwest of gridpoint 7671900N, 426800E.
- HV-32 Moist *Eriophorum vaginatum*, *Betula nana*, *Ledum palustre* ssp. *decumbens*, *Sphagnum angustifolium*, tussock-graminoid, dwarf-shrub tundra Water-track transect on top of hill, 500 m southwest of Happy Valley camp.
- HV-33 Moist *Betula nana*, *Rubus chamaemorus*, *Ledum palustre* ssp. *decumbens*, *Sphagnum* sp. dwarf-shrub, moss tundra Hummocky area at east end of water track toposequence, 500 m southwest of Happy Valley camp.
- HV-34 Wet *Eriophorum angustifolium*, *Betula nana*, *Sphagnum squarrosum* graminoid, dwarf-shrub tundra Water-track in middle of water-track transect, 500 m south west of Happy Valley camp.
- HV-35 Moist *Betula nana*, *Ledum palustre* ssp. *decumbens*, *Rubus chamaemorus*, *Aulacomnium turgidum* dwarf-shrub tundra West side of water-track transect, raised portion west side of main drainage channel of water track, 500 m south west of Happy Valley camp.
- HV-36 Moist *Salix planifolia*, *Betula nana*, *Sphagnum angustifolium*, *Sphagnum warnstorffii* low-shrub tundra Water-track transect, west side of major drainage, 500 m southwest of Happy Valley camp.
- HV-37 Wet *Carex aquatilis*, *Eriophorum angustifolium*, *Salix planifolia*, *Sphagnum squarrosum*, *Sphagnum angustifolia*, *Betula nana* graminoid, low-shrub tundra Water-track transect, west drainage channel, 500 m southwest of Happy Valley camp.
- HV-38 Moist *Ledum palustre*, *Betula nana*, *Rubus chamaemorus*, *Aulacomnium turgidum*, *Sphagnum angustifolium* dwarf-shrub tundra Water-track transect, west margin of water track, 500 m southwest of Happy Valley camp.
- HV-39 Moist *Eriophorum vaginatum*, *Betula nana*, *Sphagnum* sp. tussock-graminoid, dwarf-shrub tundra Water-track transect, island on west side of water track, 500 m southwest of Happy Valley camp.
- HV-40 Moist *Betula nana*, *Ledum palustre* ssp. *decumbens*, *Rubus chamaemorus*, *Aulacomnium turgidum* dwarf-shrub tundra Water track, 600 m southwest of Happy Valley camp.
- HV-41 Dry *Luzula arctica*, *Anthelia juratzkana* barren tundra Frost scar in shoulder of hill slope, 400 m southwest of Happy Valley camp.
- HV-42a Moist *Eriophorum vaginatum*, *Salix glauca*, *Cassiope tetragona*, *Aulacomnium turgidum*, Hillslope, 300 m southwest of Happy Valley camp.

Dicranum sp., *Sphagnum warnstorffii* tussock-graminoid, dwarf-shrub tundra

- | | | |
|--------|---|--|
| HV-42b | Dry <i>Luzula arctica</i> , <i>Racomitrium lanuginosum</i> , <i>Arctagrostis latifolia</i> barren tundra | Frostscar on hillslope, 300m southwest of Happy Valley camp. |
| HV-43 | Moist <i>Salix alaxensis</i> , <i>Shepherdia canadensis</i> tall shrubland | Small island with tall willows, 0.5 km south of Happy Valley camp. |
| HV-44 | Moist <i>Tomentypnum nitens</i> , <i>Dryas integrifolia</i> , <i>Equisetum arvense</i> , <i>Lupinus arcticus</i> forb, dwarf-shrub, moss tundra | Northwest-facing slope at bend in creek, 0.5 km south of Happy Valley camp, 100 m west of Dalton Highway. |
| HV-45 | Moist <i>Tomentypnum nitens</i> , <i>Dryas integrifolia</i> , <i>Equisetum arvense</i> , <i>Lupinus arcticus</i> forb, dwarf-shrub, moss tundra | West-facing footslope 15 m north of grid-point 7671600N 426900E. |
| HV-46 | Aquatic <i>Menyanthes trifoliata</i> forb marsh | Southern margin of small lake, 1 km west of Dalton Highway. |
| HV-47 | Wet <i>Carex rotundata</i> , <i>Carex chordorrhiza</i> , <i>Pedicularis sudetica</i> , <i>Sphagnum orientale</i> , <i>Drepanocladus</i> sp. graminoid tundra | Southern slope of small lake, wet area between raised hummock, 1 km west of Dalton Highway, 1.5 km northwest of Happy Valley camp. |
| HV-48 | Aquatic <i>Arctophila fulva</i> , <i>Menyanthes trifoliata</i> graminoid marsh | Southern margin of small lake, 1 km northwest of Happy Valley camp. |
| HV-49 | Wet <i>Carex rotundata</i> , <i>Carex aquatilis</i> , <i>Andromeda polifolia</i> , <i>Rubus chamaemorus</i> , <i>Sphagnum</i> sp. graminoid, dwarf-shrub, moss tundra | Southern edge of small lake, raised hummock area, 1 km west of Dalton Highway, 1.5 km northwest of Happy Valley camp. |
| HV-50 | Wet <i>Sphagnum imbricatum</i> , <i>Carex aquatilis</i> , <i>Betula nana</i> , <i>Andromeda polifolia</i> moss, graminoid, dwarf-shrub tundra | Southern margin of small lake, raised hummock area, 1 km west of Dalton Highway, 1.5 km northwest of Happy Valley camp. |
| HV-51 | Wet <i>Carex chordorrhiza</i> , <i>Carex rotundata</i> , <i>Sphagnum orientale</i> graminoid tundra | Southern edge of lake, 1 km west of Dalton Highway, 1.5 km northwest of Happy Valley camp. |
| HV-52 | Wet <i>Carex rotundata</i> , <i>Betula nana</i> , <i>Salix fuscescens</i> , <i>Sphagnum</i> sp. graminoid, dwarf-shrub, moss tundra | Water track, 5 km west of small lake, 1 km west of Dalton Highway, 1.5 km northwest of Happy Valley camp. |
| HV-53 | Wet <i>Carex aquatilis</i> , <i>Betula nana</i> , <i>Salix fuscescens</i> , <i>Sphagnum angustifolium</i> graminoid, dwarf-shrub, moss tundra | Water track, 0.5 km west of small lake, 1 km west of Dalton Highway, 1.5 km northwest of Happy Valley camp. |
| HV-54 | Wet <i>Carex rotundata</i> , <i>Carex chordorrhiza</i> , <i>Sphagnum orientale</i> graminoid tundra | 0.25 km west of small lake, 1 km west of Dalton Highway, 1.5 km northwest of Happy Valley camp. |
| HV-55 | Wet <i>Sphagnum imbricatum</i> , <i>Carex aquatilis</i> , <i>Betula nana</i> , <i>Andromeda polifolia</i> graminoid, dwarf-shrub, moss tundra | Raised hummock area, .25 km west of small lake, 1 km west of Dalton Highway, 1.5 km northwest of Happy Valley camp. |

Table 3. Sample site description data sheet including the legend for environmental variables.

Study Site:**Site Description**

Relevé No.: _____ Date: _____ Recording personnel: _____ Weather: _____

Study area description: _____

Slope (deg): _____ Aspect: _____ Thaw depth (cm): _____

Vegetation (describe moisture status, dominant species in each layer, dominant growth forms, and physiognomic unit): _____

Landforms	Microsites	Soil Units
1 Hills (including kames and moraines)	1 Frost-scar element	1 Pergelic Cryorthent, acid
2 Talus slope	2 Inter-frost scar element	2 Pergelic Cryopsamment
3 Colluvial basin	3 Strang or hummock	3 Pergelic Cryohemist, euic
4 Glaciofluvial and other fluvial terraces	4 Flark, interstrang, or interhummock area	4 Pergelic Cryosaprist, euic
5 Marine terrace	5 Polygon center	5 Lithic Pergelic Cryosaprist
6 Floodplains	6 Polygon trough	6 Pergelic Cryofibrist, euic
7 Drained lakes and flat lake margins	7 Polygon rim	7 Histic Pergelic Cryaquept, acid
8 Abandoned point bars and sloughs	8 Stripe element	8 Histic Pergelic Cryaquept, nonacid
9 Estuary	9 Inter-stripe element	9 Pergelic Cryaquept, acid
10 Lake or pond	10 Point bar (raised element)	10 Pergelic Cryaquept, nonacid
11 Stream	11 Slough (wet element)	11 Pergelic Cryochrept
12 Sea bluff	12 Wet element of water track	12 Pergelic Cryumbrept
13 Lake bluff	13 Moist, raised element of water track	13 Ruptic-Lithic Cryumbrept
14 Stream bluff	14 None	14 Pergelic Cryaquoll
15 Sand dunes	15 _____	15 Histic Pergelic Cryaquoll
16 Beach		16 Pergelic Cryoboroll
17 Disturbed		17 Pergelic Cryofluvent
18 Drainage channel		18 Alci Pergelic Cryochrept
19 _____		19 Pergelic cryoshpagnofibrist
20 _____		20 Ruptic Histic Pergelic Cryaquept Non acid
21 _____		21 Ruptic Pergelic Cryaquept
22 _____		22 Cryophasment
Surficial Geology (Parent Material)	Site Moisture (modified from Komárková 1983)	Exposure Scale
1 Glacial tills	1 Extremely xeric - almost no moisture; no plant growth	1 Protected from winds
2 Glaciofluvial deposits	2 Very xeric - very little moisture; dry sand dunes	2 Moderate exposure to winds
3 Active alluvial sands	3 Xeric - little moisture; stabilized sand dunes, dry ridge tops	3 Exposed to winds
4 Active alluvial gravels	4 Subxeric - noticeable moisture; well-drained slopes, ridges	4 Very exposed to winds
5 Stabilized alluvium (sands & gravels)	5 Subxeric to mesic - very noticeable moisture; flat to gently sloping	
6 Undifferentiated hill slope colluvium	6 Mesic-moderate moisture; flat or shallow depressions	Estimated Snow Duration
7 Basin colluvium and organic deposits	7 Mesic to subhygric - considerable moisture; depressions	1 Snow free all year
8 Drained lake or lacustrine organic deposits	8 Subhygric - very considerable moisture; saturated but with < 5% standing water < 10 cm deep	2 Snow free most of winter; some snow cover persists after storm but is blown free soon afterward
9 Lake or pond organic, sand, or silt	9 Hygric - much moisture; up to 100% of surface under water 10 to 50 cm deep; lake margins, shallow ponds, streams	3 Snow free prior to melt out but with snow most of winter
10 Undifferentiated sands	10 Hydric - very much moisture; 100% of surface under water 50 to 150 cm deep; lakes, streams	4 Snow free immediately after melt out
11 Undifferentiated clay		5 Snow bank persists 1-2 weeks after melt out
12 Roads and gravel pads	Soil Moisture (from Komárková 1983)	6 Snow bank persists 3-4 weeks after melt out
13 Fine grained stabilized alluvium	1 Very dry - very little moisture; soil does not stick together	7 Snow bank persists 4-8 weeks after melt out
14 _____	2 Dry - little moisture; soil somewhat sticks together	8 Snow bank persists 8-12 weeks after melt out
15 _____	3 Damp - noticeable moisture; soil sticks together but crumbles	9 Very short snow free period
16 _____	4 Damp to moist - very noticeable moisture; soil clumps	10 Deep snow all year
	5 Moist - moderate moisture; soil binds but can be broken apart	
	6 Moist to wet - considerable moisture; soil binds and sticks to fingers	Animal and Human Disturbance
	7 Wet - very considerable moisture; water drops can be squeezed out of soil	0 No sign present
	8 Very wet - much moisture can be squeezed out of soil	1 Some sign present; no disturbance
	9 Saturated - very much moisture; water drips out of soil	2 Minor disturbance or extensive sign
	10 Very saturated - extreme moisture; soil is more liquid than solid	3 Moderate disturbance; small dens or light grazing
		4 Major disturbance; multiple dens or noticeable trampling
		5 Very major disturbance; very extensive tunneling or large pit
Surficial Geomorphology	Glacial Geology	Stability
1 Frost scars	1 Till	1 Stable
2 Wetland hummocks	2 Outwash	2 Subject to occasional disturbance
3 Turf hummocks	3 Bedrock	3 Subject to prolonged but slow disturbance such as solifluction
4 Gelifluction features	4 Alluvium	4 Annually disturbed
5 Strangmoor or aligned hummocks	5 _____	5 Disturbed more than once annually
6 High- or flat-centered polygons	6 _____	
7 Mixed high- and low-centered polygons	7 _____	
8 Sorted and non-sorted stripes		
9 Palsas	Topographic Position	
10 Thermokarst pits	1 Hill crest or shoulder	
11 Featureless or with less 20% frost scars	2 Side slope	
12 Well-developed hillslope water tracks and small streams > 50 cm deep	3 Footslope or toeslope	
13 Poorly developed hillslope water tracks, < 50 cm deep	4 Flat	
14 Gently rolling or irregular microrelief		
15 Stoney surface		
16 Lakes and ponds		
17 Disturbed		
18 Island in water track		
19 Well developed water track		
	Other notes: _____	

Table 5. Environmental data collected from Happy Valley. Refer to Table 4 for values of scalars and descriptive variables.

Plot No.	Date Sampled	Landform	Surficial			Glacial Geology	Topographic Position	Soil Units	Slope (°)	Aspect
			Surficial Geology	Geo-morphology	Microsites					
HV-1	7/18/94	4	5	6	5	4	4	16	0	-
HV-2	7/18/94	4	5	14	14	4	4	16	0	-
HV-3	7/21/94	10	9	16	14	4	7	6	0	-
HV-4	7/21/94	6	5	14	14	4	4	16	0	-
HV-5	7/21/94	6	5	14	14	4	4	-	0	-
HV-6	7/21/94	4	5	11	14	4	4	17	0	-
HV-7	7/18/94	6	3/4	15	14	4	4	22	0	-
HV-8	7/18/94	6	3/4	15	14	4	4	22	0	-
HV-9	7/18/94	7	8	11	14	4	4	8	0	-
HV-10	7/18/94	4	5	11	14	4	4	17	0	-
HV-11	7/18/94	6	5	14	14	4	4	17	0	-
HV-12	7/19/94	18	13	12	12	1	5	8	15	East-facing
HV-13	7/19/94	1	1/6	4	14	1	2	-	30	East-facing
HV-14	7/19/94	6	3/4	15	14	4	4	22	0	-
HV-15	7/19/94	1	1/6	4	14	1	2	-	30	East-facing
HV-16	7/19/94	6	3/4	15	14	4	4	22	0	-
HV-17	7/19/94	1	1/6	4	14	1	2	18	25	East-facing
HV-18	7/19/94	6	5	14	14	4	4	19	0	-
HV-19	7/19/94	1	1/6	4	14	1	2	-	30	East-facing
HV-20	7/20/94	1	6	11	14	1	1	8	2	North-facing
HV-21	7/20/94	1	6	11	14	1	1	8	7	North-facing
HV-22	7/20/94	1	1/6	4	14	1	2	14	20	North-facing
HV-23	7/20/94	1	6	4	14	1	3	8	5	North-facing
HV-24	7/20/97	6	13	14	14	4	4	-	0	-
HV-25	7/20/97	6	13	14	14	4	4	16	5	South-facing
HV-26	7/24/97	1	6	11	14	1	3	19	5	South-facing
HV-27	7/24/94	1	6	11	14	1	2	19	5	South-facing
HV-28	7/24/94	1	6	11	14	1	2	19	5	South-facing
HV-29	7/24/94	1	6	11	14	1	1	19	5	South-facing
HV-30	7/24/97	1	1/6	11	14	1	1	-	0	-
HV-31	7/31/94	1	6	11	14	1	2	8	5	East-facing
HV-32	7/26/94	1	6	11	2	1	1	19	1-2	West-facing
HV-33	7/26/94	18	13	18	13	1	5	7	0	-
HV-34	7/26/94	18	13	19	12	1	5	7	5	N. East-facing
HV-35	7/27/94	18	13	18	13	1	5	7	0	-
HV-36	7/27/94	18	13	18	13	1	5	7	0	-
HV-37	7/27/94	18	13	19	12	1	5	8	0	-
HV-38	7/27/94	18	13	18	13	1	5	7	0	-
HV-39	7/27/94	1	6	11	2	1	3	7	1-2	East-facing
HV-40	7/27/94	18	13	18	13	1	5	7	5	N. East-facing
HV-41	7/26/94	1	6	1	1	1	1	10	1-2	East-facing
HV-42a	7/26/94	1	2/6	11	2	1/2	2	8/10	5	East-facing
HV-42b	7/26/94	1	2/6	11	1	1/2	2	-	5	East-facing
HV-43	7/25/94	6	5	11	14	2	4	16	0	-
HV-44	7/25/94	1	5/6	3	14	1	2	20	5	N. West-facing
HV-45	7/25/94	1	6	3	14	1	3	21	5	West-facing
HV-46	7/22/94	10	9	16	14	1	7	6	0	-
HV-47	7/27/94	7	8	11	14	1	6	3	0	-
HV-48	7/22/94	10	9	16	14	1	7	6	0	-
HV-49	7/22/94	7	7	2	14	1	4	19	0	-
HV-50	7/22/94	7	7	2	3	1	4	19	0	-
HV-51	7/22/94	7	7	11	-	1	4	6	0	-
HV-52	7/22/94	18	13	19	12	1	5	7	5	N. East-facing
HV-53	7/22/94	18	13	19	12	1	5	7	5	N. East-facing
HV-54	7/22/94	3	7	11	14	1	4	6	0	-
HV-55	7/22/94	3	7	2	14	7	1	4	0	-

Table 5 concluded. Environmental data collected from Happy Valley.

Plot No.	Thaw Depth (cm)	Site Moisture (Scalar)	Soil Moisture (Scalar)	Exposure (Scalar)	Snow Duration (Scalar)	Animal/Human Disturbance (Scalar)	Stability (Scalar)
HV-1	>41	5	3	3	4	2	1
HV-2	>26	5	3	3	4	2	1
HV-3	51	10	10	3	-	0	1
HV-4	30.2±4.6	6	5	2	4/5	0	5
HV-5	21±2.4	6	5	2	5	0	5
HV-6	>30	5	5	3	4	1	1
HV-7	-	3	4	3	4	0	5
HV-8	-	4	3	3	4	0	5
HV-9	52.2±1.8	7	7	2	4	0	5
HV-10	44±1.9	5	5	3	4	0	1
HV-11	81.6±5.5	5	3	2	5	3	4
HV-12	40.0	8	9	2	4	0	5
HV-13	>40	5	5	2	3	1	3
HV-14	-	4	3	3	4	0	5
HV-15	>37	6	5	2	3	1	3
HV-16	-	2	2	3	4	0	5
HV-17	>41	5	4	1	5	3	3
HV-18	68	6	6	2	5	3	4
HV-19	>76	5	2	2	3	1	3
HV-20	22±2.4	6	3	3	4	1	1
HV-21	19.3±2.2	6	3	2	4	1	1
HV-22	86	5.5	6	1	5	0	3
HV-23	47.8±4.5	6	6	2	4	3	3
HV-24	24.8±1.4	7	7	2	4	2	5
HV-25	26.8±3	-	5	2	4	1	5
HV-26	22±1.2	6	7	2	4	1/2	1
HV-27	23±2.3	6	6/7	2	4	1/2	1
HV-28	28±4.1	6	6/7	2	4	3	1
HV-29	26.3±2	6	6/7	2	4	2	1
HV-30	17.4±1.5	6	6	3	4	2	1
HV-31	36.4±2	6	6/7	3	4	1	1
HV-32	23.4±.5	6	6/7	3	4	2	1
HV-33	30.2±2.8	7	6/7	2	4	0	1/2
HV-34	23.6±.4	8	9	2	4	0	5
HV-35	55.2±3.8	6	6/7	2	4	1	1/2
HV-36	28.8±1.2	7	7	2	4	-	2
HV-37	68.4±4.6	8	9	2	4	0	5
HV-38	28.6±2.5	7	6/7	2	4	1	2
HV-39	29.6±1.7	5/6	6/7	3	4	1	1
HV-40	25±2.2	5	6/7	3	4	0	1
HV-41	48.8±4.6	5	6	2	4	2	3
HV-42a	44.6±4.6	6	6/7	3	4	2	1
HV42b	-	-	-	3	4	-	3
HV-43	>52	6	3	2	4	5	2
HV-44	62	6	5	2	4	3	3
HV-45	58.8±1.9	6	5	2	4	2	3
HV-46	42.6±.6	10	10	3	4	0	1
HV-47	42.8±.8	9	9	3	4	0	1
HV-48	39±1	10	10	3	4	3	1
HV-49	21.4±1.8	7	7	3	4	1	1
HV-50	33±3.1	7	7	3	4	1	1
HV-51	41.2±1.6	9	9	3	4	-	1
HV-52	49.2±3	7	7	3	4	1/2	5
HV-53	36.2±3	7	7	3	4	1/2	5
HV-54	34.8±1.2	9	9	3	4	0	1
HV-55	35±3.6	7	7	3	4	1	1

Table 6. Relevé size, percent live cover and non-living cover, and height of vegetation.

	Approx. relevé size (m)	Tall shrubs	Low shrubs	Dwarf shrubs	Evergreen shrubs	Deciduous shrubs	Forbs	Horsetails	Graminoids
HV-1	10 X 10	0	10	70	60	20	15	0	5
HV-2	10 X 10	0	0	5	65	25	15	0	10
HV-3	10 X 3	0	0	0	0	0	30	0	0
HV-4	3 X 30	0	90	20	<1	100	10	0	5
HV-5	10 X 10	0	90	10	<1	100	25	0	<1
HV-6	10 X 10	0	0	65	60	15	20	0	3
HV-7	40 X 10	0	1	5	0	6	30	0	5
HV-8	20 X 30	0	5	10	0	15	20	0	1
HV-9	10 X 10	0	0	0	0	0	10	0	70
HV-10	10 X 10	0	0	75	65	20	20	0	5
HV-11	20 X 20	0	40	30	0	70	5	0	5
HV-12	3 x 20	0	60	0	0	0	0	40	60
HV-13	10 x 10	0	75	25	0	80	15	0	5
HV-14	10 x 40	0	5	10	0	15	35	0	15
HV-15	10 x 10	0	60	25	1	75	10	0	5
HV-16	20 x 40	0	2	5	0	5	40	0	10
HV-17	20 x 20	0	0	70	60	20	20	0	5
HV-18	20 x 20	0	50	20	0	60	20	30	-
HV-19	10 x 10	0	65	25	<1	75	30	0	10
HV-20	10 x 10	0	0	40	25	20	2	0	30
HV-21	10 x 10	0	5	30	30	20	5	0	35
HV-22	20 x 10	0	15	60	50	25	15	0	5
HV-23	10 x 10	0	15	30	30	15	5	0	5
HV-24	5 x 20	0	65	10	0	70	40	15	15
HV-25	5 x 20	0	75	5	<1	75	20	0	5
HV-26	10 x 10	0	0	35	20	20	1	0	30
HV-27	10 x 10	0	0	50	25	40	2	0	35
HV-28	10 x 10	0	0	30	20	30	2	0	50
HV-29	10 x 10	0	0	30	20	30	10	0	50
HV-30	10 x 10	0	0	30	20	20	15	0	30
HV-31	10 x 10	0	0	25	15	15	5	0	35
HV-32	10 x 10	0	0	40	25	20	2	0	45
HV-33	5 x 5	0	0	60	20	40	1	0	<1
HV-34	10 x 10	0	0	30	0	30	0	0	40
HV-35	5 x 5	0	0	40	30	20	<1	0	3
HV-36	10 x 10	0	50	25	20	60	<1	0	<1
HV-38	10 x 5	0	0	70	35	40	<1	0	<1
HV-39	10 x 10	0	0	30	20	15	<1	0	15
HV-40	-	0	0	70	40	30	<1	0	<1
HV-41	25 x 30	0	0	5	5	0	1	0	1
HV-42a	10 x 10	0	2	30	20	20	7	0	45
HV-42b	1 x 1	0	0	25	20	5	5	0	5
HV-43	20 x 20	25	30	10	0	55	50	0	25
HV-44	10 x 10	0	0	25	20	15	20	15	10
HV-45	10 x 10	0	0	20	15	10	15	15	5
HV-46	10 x 10	0	0	0	0	0	20	0	0
HV-47	10 x 10	0	0	0	0	0	3	0	30
HV-48	10 x 10	0	0	0	0	0	7	0	15
HV-49	1.5 x 15	0	0	50	35	20	7	0	20
HV-50	1.5 x 20	0	0	20	10	10	1	0	15
HV-51	10 x 10	0	0	0	0	0	0	0	30
HV-52	4 x 20	0	0	25	<1	25	<1	0	25
HV-53	5 x 20	0	0	15	0	15	<1	0	25
HV-54	10 x 10	0	0	0	0	0	<1	0	30
HV-55	4 x 20	0	0	15	10	5	<1	0	20

Table 6 concluded. Relevé size, percent live cover and non-living cover, and height of vegetation.

	Lichens	Bryophytes	Rocks	Bare soil	Water	Frost scars	Total dead	Height of vegetation (cm)
HV-1	20	25	0	5	0	0	25	40
HV-2	35	20	0	5	0	0	25	40
HV-3	0	80	0	0	100	0	0	15
HV-4	<1	30	0	15	0	0	5	200
HV-5	<1	60	0	5	0	0	5	200
HV-6	25	40	0	3	0	0	3	10
HV-7	0	0	0	15*	0	0	3	-
HV-8	0	0	90	5*	0	0	2	-
HV-9	0	25	0	0	2	0	20	65
HV-10	10	25	0	10	0	5	15	10
HV-11	25	10	0	15	0	0	20	200
HV-12	20	10	0	30	0	5	10	160
HV-13	0	30	0	<1	0	0	5	140
HV-14	0	-	-	-	-	-	-	-
HV-15	<1	20	0	<1	0	0	5	100
HV-16	0	0	50	30*	0	0	10	40
HV-17	3	770	0	2	0	0	10	15
HV-18	-	-	0	5	0	0	15	140
HV-19	2	30	<1	20	0	0	10	80
HV-20	5	60	0	1	0	5	10	20
HV-21	10	60	0	1	1	5	20	30
HV-22	2	70	0	<1	0	0	10	80
HV-23	1	90	0	0	0	0	7	60
HV-24	<1	65	0	0	0	0	10	140
HV-25	-	-	0	0	0	0	5	100
HV-26	0	80	0	0	0	0	10	30
HV-27	2	65	0	1	0	5	15	40
HV-28	5	50	0	1	0	10	25	40
HV-29	10	0	2	0	15	25	30	40
HV-30	15	50	10	5	0	25	20	30
HV-31	31	65	0	1	0	5	15	40
HV-32	5	60	0	1	0	5	20	30
HV-33	0	95	0	0	0	0	2	15
HV-34	<1	40	0	5	10	0	20	40
HV-35	<1	0	0	0	0	0	2	25
HV-36	1	70	0	0	0	0	5	60
HV-38	<1	70	0	0	0	0	10	20
HV-39	2	40	0	1	5	5	20	25
HV-40	2	50	0	0	0	0	5	-
HV-41	20	10	0	75	0	100	10	50
HV-42a	3	45	0	5	0	70	15	20
HV-42b	20	25	0	50	0	100	20	40
HV-43	0	5	1	5	0	0	10	400
HV-44	3	60	0	2	0	20	20	40
HV-45	5	70	0	2	0	5	20	30
HV-46	0	0	0	0	100	0	0	15
HV-47	0	75	0	0	65	0	15	20
HV-48	0	0	0	0	100	0	3	20
HV-49	0	95	0	0	0	0	15	10
HV-50	0	100	0	0	0	0	10	10
HV-51	0	50	0	0	100	0	5	20
HV-52	0	100	0	0	0	0	25	20
HV-53	0	95	0	0	0	0	25	20
HV-54	0	50	0	0	100	0	3	20
HV-55	<1	95	0	0	0	0	15	10

* = sand

Table 7. Soils data from Happy Valley reserves.

Plot #	Sample ID #	Horizon	pH (paste)	mmhos/cm E.C.	Lime Est.	% O.M.	NO ₃ -N	P	ppm NH ₄ CO ₃ -DTPA Extract	Fe	Mn	Cu	Sand	Silt	Clay	Texture	Ca	Mg	Na	K	Sodium adsorption ratio
HV-1	S-68	Oa	7.3	0.6	L	38.1	2	15.6	64.6	180.1	30.2	4.4	53	NES*	5	SL	7.98	0.80	0.10	0.17	0.05
HV-1	S-69	B	8.0	0.3	H	2.7	1	<0.2	5.9	61.8	6.2	4.3	53	NES*	5	SL	4.04	0.35	0.12	0.05	0.08
HV-2	S-70	Oa	7.2	0.8	L	42.2	2	14.2	131.4	50.7	21.4	4.3	54	NES*	6	SL	10.48	0.99	0.11	0.64	0.05
HV-2	S-71	B	8.0	0.4	H	3.6	1	1.8	12.3	36.4	4.5	3.7	54	NES*	6	SL	4.74	0.39	0.09	0.06	0.06
HV-3	S-72	Oa	6.8	0.3	L	39.2	3	8.4	4.3	871.7	136.4	10.1	29	NES*	8	ORG	2.64	0.36	0.11	0.04	0.09
HV-4	S-73	Oa	5.9	0.6	L	35.5	10	17.2	156.9	793.8	398.6	5.7	29	NES*	8	ORG	5.49	1.56	0.16	0.54	0.09
HV-4	S-74	A1	6.2	0.4	M	23.1	5	1.2	61.9	28.1	266.8	160.1	4.6	36	63	SIL	4.74	1.07	0.17	0.10	0.10
HV-4	S-75	A2	7.3	0.6	M	14.0	3	2.5	30.2	137.6	46.1	4.3	56	38	6	SIL	6.99	0.67	0.16	0.04	0.08
HV-4	S-76	B	7.5	0.7	M	9.4	2	0.9	26.4	126.3	16.1	3.7	56	38	6	SIL	7.98	0.61	0.16	0.06	0.08
HV-4	S-77	C	7.5	0.6	L	8.3	<1	<0.2	16.5	131.9	15.9	2.9	62	32	6	SL	5.99	0.57	0.18	0.05	0.10
HV-5	S-78	Oa	6.0	0.6	L	50.9	4	19.6	448.7	384.9	310.2	6.4	26	NES*	64	ORG	5.99	1.81	0.36	0.43	0.18
HV-5	S-79	Oa	6.3	0.6	L	52.0	2	2.4	177.9	78.3	456.2	4.5	26	NES*	64	ORG	8.98	1.56	0.20	0.28	0.09
HV-5	S-80	A	7.0	0.7	L	55.0	4	3.6	123.4	267.0	171.3	5.5	26	NES*	64	ORG	5.49	0.76	0.22	0.13	0.13
HV-5	S-81	B	7.9	0.4	H	8.6	<1	<0.2	23.7	104.9	10.0	11.2	26	NES*	64	ORG	10.48	1.48	0.17	0.38	0.07
HV-6	S-82	Oa	7.2	0.8	L	26.2	<1	4.2	108.6	157.5	40.8	5.1	26	NES*	64	ORG	7.49	0.90	0.17	0.28	0.08
HV-6	S-83	A	7.2	0.6	M	32.0	4	1.2	77.8	181.5	32.2	7.7	80	16	4	ORG	9.48	1.23	0.19	0.19	0.08
HV-6	S-84	IIOa	7.3	0.7	L	38.2	4	1.2	89.4	11.9	41.7	6.2	80	16	4	LS	7.49	0.68	0.16	0.11	0.08
HV-6	S-85	IIB	7.5	0.6	M	7.8	<1	<0.2	20.5	51.9	11.8	4.2	83	15	2	LS	3.09	0.68	0.24	0.07	0.17
HV-7	S-86	C	8.1	0.3	H	1.3	1	<0.2	18.3	28.9	2.7	2.5	74	21	5	SL	3.29	0.75	0.26	0.08	0.18
HV-8	S-87	C	8.1	0.4	H	1.5	1	<0.2	19.5	28.4	3.2	2.2	74	21	5	SL	5.49	0.82	0.17	0.31	0.10
HV-9	S-88	Oa	7.9	0.4	L	78.2	17	62.0	118.2	484.8	237.0	6.3	69	20	11	SL	5.99	0.74	0.25	0.10	0.15
HV-9	S-89	A1	7.9	0.4	L	18.9	2	1.8	15.6	26.7	12.9	4.0	69	20	11	SL	4.74	0.74	0.25	0.10	0.15
HV-9	S-90	A2	7.8	0.4	M	10.2	1	<0.2	20.8	84.3	10.7	11.9	40	47	13	ORG	5.99	0.90	0.23	0.16	0.12
HV-10	S-91	Oa	6.8	0.8	L	59.6	4	15.6	197.3	99.7	59.3	5.1	46	44	10	ORG	9.98	1.15	0.12	0.82	0.05
HV-10	S-92	B1	7.3	0.6	M	10.1	2	<0.2	28.7	110.0	5.0	5.7	46	44	10	L	6.49	0.76	0.12	0.08	0.06
HV-10	S-93	B2	8.2	0.4	H	9.8	3	<0.2	18.5	95.2	10.0	6.1	46	44	10	L	5.99	0.62	0.15	0.09	0.08
HV-10	S-94	B3	8.1	0.4	H	3.7	<1	<0.2	19.5	2.9	3.6	2.5	42	51	7	SL	3.69	0.46	0.16	0.10	0.11
HV-10	S-95	A	8.0	0.6	H	6.1	1	<0.2	44.1	85.0	10.4	6.2	44	50	6	SIL/SL	5.49	0.50	0.18	0.28	0.10
HV-11	S-96	C2	8.0	0.4	H	5.4	1	<0.2	17.0	66.7	6.5	3.4	65	29	6	SL	4.99	0.55	0.21	0.08	0.13
HV-12	S-97	Oa	6.5	0.4	L	69.4	18	25.0	40.0	2988.5	216.0	25.5	28	NES*	18	ORG	4.29	0.90	0.28	0.15	0.17
HV-12	S-98	Oa	6.5	0.6	L	18.9	2	<0.2	33.2	99.8	9.8	7.9	28	54	18	SL	4.29	1.15	0.38	0.05	0.21
HV-13	S-99	Oa/B	6.3	0.4	L	24.8	2	11.5	96.9	380.9	34.9	5.3	34	52	14	SL	4.94	1.15	0.15	0.16	0.08
HV-13	S-100	Oa	6.4	0.7	L	56.7	4	26.2	268.8	65.1	65.1	3.9	34	NES*	14	ORG	7.98	1.56	0.17	0.56	0.08
HV-13	S-101	Oa	6.5	0.6	L	44.0	4	9.2	114.2	316.5	38.9	4.4	32	46	22	ORG	4.99	0.99	0.17	0.10	0.10
HV-13	S-102	B	7.7	0.4	M	6.8	1	<0.2	62.5	87.5	7.9	10.5	32	46	22	L	4.99	0.68	0.19	0.07	0.11
HV-14	S-103	C	8.0	0.3	H	0.9	<1	<0.2	18.1	22.6	3.6	1.5	83	13	4	LS	3.24	0.49	0.16	0.09	0.12
HV-15	S-104	Oa	6.5	0.8	L	78.6	<1	31.2	689.3	192.6	68.0	2.9	44	NES*	14	ORG	6.99	1.32	0.19	0.59	0.10
HV-15	S-105	Oa/B	6.7	0.7	L	39.6	2	5.6	213.8	51.6	41.2	3.5	44	NES*	14	ORG	7.98	0.81	0.22	0.06	0.11
HV-15	S-106	Oa/B	7.4	0.6	M	7.4	2	1.5	37.6	71.5	10.3	7.8	44	NES*	14	L	6.99	0.81	0.22	0.06	0.11
HV-15	S-107	B	7.8	0.6	M	4.6	<1	1.5	31.4	65.9	6.7	6.3	63	NES*	5	SL	5.99	0.74	0.26	0.11	0.14
HV-16	S-108	C	8.0	0.3	H	1.2	<1	<0.2	22.2	30.1	4.2	2.7	63	NES*	5	SL	3.09	0.65	0.15	0.06	0.11
HV-17	S-109	Oa	6.8	0.6	L	66.0	29	28.0	78.1	261.5	50.7	4.8	63	NES*	5	ORG	6.99	0.66	0.17	0.25	0.09
HV-17	S-110	A/B	7.1	0.6	M	7.2	2	0.3	27.7	163.8	5.4	5.7	38	44	18	L	5.99	0.57	0.20	0.04	0.11
HV-17	S-111	C	7.4	0.4	M	6.8	<1	<0.2	23.0	87.1	5.0	6.8	50	32	18	L	5.49	0.60	0.21	0.08	0.12
HV-18	S-112	Bw	7.9	0.6	H	2.9	<1	<0.2	18.7	87.0	6.8	6.4	48	48	4	SL	4.99	0.75	0.18	0.09	0.11
HV-19	S-113	O/A	7.1	0.6	L	41.7	4	4.2	35.8	137.9	19.0	7.3	68	16	16	ORG	7.49	0.61	0.17	0.02	0.08
HV-20	S-114	C	5.2	0.6	M	5.2	2	<0.2	11.8	51.7	5.7	3.9	68	16	16	SL	4.99	0.90	0.25	0.13	0.14
HV-20	S-115	Oa	4.7	0.4	L	84.4	30	121.0	734.6	138.1	490.8	5.6	68	NES*	16	ORG	2.20	0.76	0.29	1.33	0.24
HV-20	S-116	Oa	4.7	0.3	L	94.3	20	180.0	758.9	100.5	92.1	39.0	68	NES*	16	ORG	1.45	0.62	0.19	1.13	0.19
HV-20	S-117	Bs	5.2	0.3	L	85.1	27	15.0	152.2	464.0	130.3	13.0	68	NES*	16	ORG	1.75	0.77	0.22	0.25	0.20
HV-20	S-118	Oa	5.2	0.3	L	7.4	NES*	2.4	31.6	191.66	10.6	4.7	12	NES*	30	ORG	1.50	0.60	0.24	0.06	0.24
HV-20	S-119	Bw	5.2	0.4	L	7.1	NES*	<0.2	31.1	400.6	8.7	9.2	12	NES*	30	SIL	1.40	0.62	0.24	0.06	0.24
HV-21	S-120	Oa	5.5	0.4	L	80.5	20	6.0	993.9	63.4	175.4	11.8	12	NES*	30	ORG	1.85	0.66	0.21	1.41	0.19
HV-21	S-121	Oa	6.4	0.4	L	85.4	20	8.4	971.8	1038.5	418.8	22.8	12	NES*	30	ORG	4.19	1.15	0.25	0.90	0.15
HV-21	S-122	Bw	5.7	0.4	L	7.1	2	<0.2	64.9	375.9	10.3	11.2	12	NES*	30	ORG	1.90	0.70	0.28	0.09	0.24
HV-21	S-123	Oa	6.1	0.4	L	82.0	15	18.0	732.7	131.4	202.9	11.0	12	NES*	30	ORG	2.50	0.90	0.25	1.18	0.19
HV-22	S-124	Oa	5.6	0.3	L	67.6	20	6.0	74.1	1450.2	172.5	13.2	42	NES*	16	ORG	3.20	0.80	0.12	0.22	0.09
HV-22	S-125	A	5.7	0.3	L	26.8	14	3.0	<0.1	1638.0	76.2	10.7	42	NES*	16	L	2.50	0.63	0.12	0.08	0.10
HV-22	S-126	B	5.9	0.1	L	6.7	4	<0.2	11.8	305.3	3.0	5.6	16	NES*	28	SIL	1.75	0.49	0.16	0.10	0.16
HV-23	S-127	Oa	5.5	0.4	L	64.7	29	37.0	1100.5	110.0	47.1	9.2	16	NES*	28	ORG	2.69	0.70	0.24	1.46	0.19
HV-23	S-128	Oa	6.7	1.0	L	87.5	10	118.0	340.5	29.0	136.7	9.6	16	NES*	28	ORG	9.48	0.82	0.34	1.33	0.15
HV-23	S-129	Oa	6.7	0.6	L	80.5	27	29.6	29.8	34.7	67.1	10.8	18	NES*	34	ORG	5.49	0.82	0.27	0.26	0.15
HV-23	S-130	B	6.8	0.4	L	6.9	5	0.4	<0.1	314.7	7.5	11.4	18	NES*	34	SIL	4.14	0.63	0.28	0.46	0.18
HV-24	S-131	Oa	7.4	0.7	L	21.2	4	13.2	280.1	21.4	102.3	6.1	46	NES*	12	ORG	6.99	0.82	0.27	0.05	0.16
HV-24	S-132	A	7.0	0.4	L	7.2	<1	3.0	59.1	340.7	37.4	7.7	46	NES*	12	L	4.99	0.61	0.27	0.05	0.16
HV-25	S-133	Oa	5.5	0.6	L	40.0	5	10.0	442.1	1055.5	728.6	7.2	24	NES*	16	ORG	3.94	1.64	0.35	0.86	0.21
HV-25	S-134	A	5.1	0.3	L	7.4	3	1.2	82.1	38.9	728.6	5.9</									

Table 7. Soils data from Happy Valley reserves.

Plot #	Sample ID #	Horizon	pH (paste)	mmhos/cm E.C.	Line Est.	% O.M.	NO ₃ -N	P	NH ₄ HCO ₃ -DTPA Extract - ppm				Cu	% Sand Silt Clay			Texture	Ca	Mg	Na	K	Sodium adsorption ratio
									K	Zn	Fe	Mn										
HV-26	S-137	O _e	4.8	0.3	L	88.6	4	44.8	332.9	75.7	1541.2	49.4	14.9	16	NES*	24	ORG	1.15	0.47	0.07	0.36	0.08
HV-27	S-138	Bw	4.9	0.3	L	7.4	3	1.2	32.6	12.0	937.4	5.5	8.4	60	NES*	24	SIL	1.60	0.72	0.13	0.04	0.13
HV-28	S-139	O _e	3.5	0.3	L	68.9	30	131.0	1531.3	151.2	194.4	580.9	7.2	1.40	NES*	24	ORG	1.40	0.57	0.12	1.18	0.12
HV-29	S-140	O _{i2}	4.8	0.6	L	84.8	9	193.0	1776.0	73.5	958	460.1	8.0	2.59	NES*	24	ORG	2.59	1.07	0.06	2.02	0.05
HV-27	S-141	O _e	5.5	0.4	L	88.6	19	99.0	618.4	35.5	1136.4	684.0	10.3	2.05	NES*	24	ORG	2.05	0.74	0.07	0.51	0.06
HV-27	S-142	O _a	5.4	0.4	L	80.0	<1	14.8	269.6	55.5	1254.2	941.5	8.6	2.25	NES*	24	ORG	2.25	0.81	0.08	0.24	0.06
HV-27	S-143	Bw	4.8	0.3	L	7.1	<1	6.0	32.5	6.6	608.8	37.4	2.9	18	NES*	26	SIL	1.85	0.77	0.12	0.04	0.11
HV-28	S-144	O _e	5.1	0.3	L	81.8	8	140.0	986.0	89.9	360.0	249.0	8.4	2.20	NES*	26	ORG	2.20	0.90	0.05	0.79	0.04
HV-28	S-145	O _e	5.4	0.6	L	90.3	<1	124.0	794.0	74.4	932.0	446.0	10.0	3.59	NES*	26	ORG	3.59	1.32	0.09	1.02	0.06
HV-28	S-146	O _a	5.2	0.3	L	76.4	<1	11.2	163.0	21.2	1550.0	197.0	13.3	1.10	NES*	26	ORG	1.10	0.72	0.05	0.10	0.04
HV-28	S-147	B	7.1	0.1	L	7.1	1	0.6	38.0	8.2	535.0	16.4	4.2	22	NES*	26	ORG	1.55	0.67	0.22	0.66	0.21
HV-29	S-148	O _e	5.1	0.3	L	81.4	12	196.0	530.0	100.6	293.0	215.0	4.7	1.55	NES*	26	ORG	1.55	0.67	0.22	0.66	0.21
HV-29	S-149	O _e	5.3	0.6	L	85.7	6	66.0	547.8	45.1	596.2	587.2	10.8	3.54	NES*	26	ORG	3.54	1.23	0.18	0.77	0.12
HV-29	S-150	O _a	5.2	0.3	L	44.3	4	3.0	111.3	8.6	833.5	91.8	7.0	2.50	NES*	26	ORG	2.50	0.99	0.18	0.04	0.13
HV-29	S-151	Bw	5.2	0.3	L	5.5	5	5.0	99.7	8.3	818.4	92.7	7.3	1.90	NES*	29	SIL	1.90	0.76	0.22	1.18	0.19
HV-30	S-152	O _{i1}	4.3	0.4	L	83.1	8	187.0	1536.5	31.3	148.8	384.2	5.2	1.65	NES*	29	SIL	1.65	0.67	0.07	1.84	0.06
HV-30	S-153	O _{i2}	4.4	0.3	L	80.4	NES*	106.0	223.3	30.3	629.4	956.6	10.2	2.25	NES*	29	ORG	2.25	0.99	0.14	0.51	0.03
HV-30	S-154	O _a	5.9	0.4	L	82.8	7	34.8	223.3	3.8	355.9	433.4	7.6	2.1	NES*	25	SIL	3.59	0.99	0.14	0.26	0.09
HV-30	S-155	Bw	5.8	0.4	L	7.4	2	<0.2	56.9	8.0	327.7	195.0	10.2	2.89	NES*	25	ORG	2.89	0.99	0.12	0.82	0.17
HV-31	S-156	O _e	5.8	0.4	L	NES*	7	53.0	791.8	140.4	32.7	195.0	16.7	2.35	NES*	29	CL	2.35	0.55	0.12	0.19	0.09
HV-31	S-157	O _a	6.1	0.3	L	84.2	5	32.4	169.3	80.8	228.2	210.7	2.8	2.35	NES*	29	CL	2.35	0.55	0.12	0.19	0.09
HV-31	S-158	Bw	6.0	0.3	L	5.3	2	1.2	33.8	3.6	255.4	16.3	5.5	1.15	NES*	29	ORG	1.15	0.60	0.18	1.20	0.19
HV-32	S-159	O _i	4.3	0.4	L	86.1	14	140.0	1599.7	182.4	502.3	500.1	5.5	2.05	NES*	29	ORG	2.05	0.90	0.08	0.33	0.07
HV-32	S-160	O _e	4.8	0.4	L	83.8	3	11.2	273.0	50.6	1841.4	984.2	8.0	1.75	NES*	29	SIL	1.75	0.99	0.16	2.35	0.14
HV-32	S-161	Bw	4.9	0.4	L	7.4	<1	1.8	50.1	7.8	893.5	62.8	6.7	1.45	NES*	29	ORG	1.45	0.74	0.31	0.74	0.29
HV-33	S-162	O _e	4.2	0.3	L	89.6	6	196.0	890.7	81.7	580.4	194.9	5.5	1.55	NES*	29	ORG	1.55	0.74	0.12	0.28	0.12
HV-33	S-163	O _e	4.7	0.3	L	86.3	20	37.0	360.8	61.9	808.1	224.3	7.1	1.50	NES*	29	ORG	1.50	0.49	0.09	0.28	0.09
HV-33	S-164	O _{e2}	4.7	0.3	L	90.1	30	43.0	350.4	22.6	4231.3	20.7	17.4	2.15	NES*	25	SIL	2.15	0.66	0.09	0.05	0.07
HV-33	S-165	Bw	5.1	0.3	L	7.5	4	0.6	26.4	6.0	724.5	7.0	5.9	1.85	NES*	25	ORG	1.85	0.28	0.07	0.20	0.11
HV-34	S-166	O _e	5.6	0.1	L	NES*	<1	127.0	573.3	92.4	2113.5	310.7	16.5	1.30	NES*	25	ORG	1.30	0.52	0.07	0.07	0.08
HV-34	S-167	O _a	5.1	0.3	L	7.8	4	1.2	76.3	21.3	769.5	20.9	7.5	2.66	NES*	25	ORG	2.66	0.79	0.13	0.06	0.11
HV-34	S-168	O _{e2}	4.9	0.3	L	75.4	13	2.4	146.4	86.4	1655.9	47.5	10.9	2.0	NES*	20	SIL	3.44	1.23	0.22	0.02	0.14
HV-34	S-169	Bw	4.6	0.4	L	7.5	1	0.3	26.0	8.1	759.5	12.0	7.4	1.75	NES*	20	ORG	1.75	0.99	0.16	2.35	0.14
HV-35	S-170	O _i	4.3	0.6	L	85.8	6	109.0	2199.0	69.4	248.2	517.0	6.8	1.40	NES*	20	ORG	1.40	0.82	0.14	1.51	0.12
HV-35	S-171	O _{e1}	4.2	0.4	L	91.7	<1	124.0	1512.4	138.4	182.6	292.2	6.8	1.69	NES*	20	ORG	1.69	0.90	0.13	0.87	0.10
HV-35	S-172	O _{e2}	4.0	0.4	L	93.8	2	115.0	816.4	100.5	333.8	74.9	6.9	2.00	NES*	20	ORG	2.00	0.80	0.16	0.09	0.14
HV-35	S-173	Bw	4.8	0.3	L	78.7	29	16.0	224.9	29.2	6846.8	94.8	8.9	1.40	NES*	18	ORG	1.40	0.80	0.16	0.09	0.14
HV-35	S-174	O _e	4.8	0.3	L	7.5	4	2.4	47.3	7.8	1273.0	12.7	9.8	1.5	NES*	18	SIL	2.45	1.15	0.17	0.51	0.13
HV-36	S-175	O _i	5.0	0.4	L	81.7	10	87.0	635.0	228.9	1481.0	820.4	10.6	1.00	NES*	20	ORG	1.00	0.46	0.16	0.22	0.19
HV-36	S-176	O _e	5.3	0.3	L	76.3	1	3.1	180.0	71.3	3660.0	47.1	8.4	0.85	NES*	20	ORG	0.85	0.38	0.12	0.12	0.15
HV-36	S-177	HO _e	5.2	0.1	L	72.8	24	37.0	180.0	71.3	3660.0	47.1	8.4	1.55	NES*	20	ORG	1.55	0.67	0.20	0.08	0.19
HV-36	S-178	HO _e	5.0	0.3	L	29.1	1	1.8	82.9	11.2	906.8	16.8	18.2	3.24	NES*	20	SIL	3.24	1.40	0.24	0.07	0.16
HV-36	S-179	HO _e	4.8	0.4	L	7.5	4	3.6	50.6	15.3	724.2	18.1	10.7	1.40	NES*	20	ORG	1.40	0.65	0.15	0.77	0.14
HV-37	S-180	O _e	4.9	0.3	L	78.8	NES*	65.0	196.0	74.1	4000.4	122.2	20.1	1.20	NES*	20	ORG	1.20	0.50	0.17	0.17	0.18
HV-37	S-181	O _e	5.1	0.3	L	75.4	30	34.0	196.0	34.6	2105.7	26.1	13.4	1.85	NES*	21	ORG	1.85	0.73	0.15	0.05	0.13
HV-37	S-182	O _a	4.9	0.3	L	59.7	<1	13.6	71.5	8.9	911.1	14.3	12.1	1.60	NES*	21	SIL	1.60	0.60	0.12	0.02	0.12
HV-37	S-183	HO _e	4.8	0.3	L	7.4	<1	1.2	19.3	102.5	2481.1	301.9	7.5	1.80	NES*	21	ORG	1.80	0.60	0.12	0.61	0.17
HV-38	S-184	Bw	4.5	0.4	L	84.2	19	115.0	466.0	132.5	777.6	321.1	10.6	1.05	NES*	21	ORG	1.05	0.54	0.24	0.51	0.20
HV-38	S-185	O _{i2}	4.2	0.3	L	92.1	6	134.0	1298.4	64.5	3320.0	527.0	7.8	2.79	NES*	21	ORG	2.79	0.90	0.17	0.84	0.20
HV-38	S-186	O _e	5.0	0.4	L	83.9	15	8.4	299.0	16.3	2193.8	36.7	13.6	1.55	NES*	21	ORG	1.55	0.54	0.23	0.18	0.23
HV-38	S-187	Bw	4.9	0.3	L	70.9	3	10.4	194.5	16.3	2193.8	36.7	13.6	1.40	NES*	21	ORG	1.40	0.54	0.23	0.18	0.23
HV-38	S-188	O _a	4.6	0.6	L	7.7	2	9.8	40.3	9.4	769.1	10.7	9.0	1.30	NES*	21	ORG	1.30	0.57	0.12	0.24	0.12
HV-39	S-189	O _e	4.8	0.3	L	75.2	<1	84.0	175.0	44.7	3340.0	46.2	19.8	1.70	NES*	21	ORG	1.70	0.80	0.12	0.24	0.12
HV-39	S-190	O _e	4.8	0.3	L	81.7	<1	1.5	18.8	6.5	571.0	5.8	4.7	0.80	NES*	21	ORG	0.80	0.35	0.15	0.56	0.19
HV-39	S-191	Bw	4.7	0.3	L	7.2	<1	112.0	384.0	51.6	688.0	112.0	6.4	1.45	NES*	21	ORG	1.45	0.44	0.13	0.39	0.14
HV-40	S-192	O _e	4.1	0.3	L	85.7	4	71.0	577.0	63.5	1890.0	95.1	10.0	1.75	NES*	21	ORG	1.75	0.57	0.12	0.16	0.11
HV-40	S-193	O _e	4.3	0.3	L	89.3	45	21.0	57.7	55.0	9580.0	212.0	18.4	0.95	NES*	21	ORG	0.95	0.32	0.13	0.14	0.16
HV-40	S-194	O _a	4.6	0.3	L	65.7	10	40.0	102.0	64.9	6920.0	48.6	21.0	1.60	NES*	21	ORG	1.60	0.69	0.19	0.23	0.25
HV-40	S-195	HO _e	4.8	0.3	L	85.7	5	3.0	25.6	7.9	1272.0	15.3	8.4	1.4	NES*	32	SIL	1.4	0.54	0.27	0.12	0.12
HV-41	S-196	O _{i1}	4.6	0.3	L	21.8	5	3.0	25.6	7.9	1272.0	15.3	8.4	1.6	NES*	30	SIL	1.6	0.54	0.27	0.12	0.12
HV-41	S-197	Bw	4.9	0.																		

Table 7. Soils data from Happy Valley reeves.

Plot #	Sample ID #	Horizon	pH (paste)	mmhos/cm	Lime Est.	% O.M.	NO ₃ -N	P	K	Zn	Fe	Mn	Cu	Sand	Silt	Clay	Texture	Ca	Mg	Na	K	Sodium adsorption ratio
HV-44	S-207	Os	6.1	0.6	L	62.1	34	56.0	447.5	43.5	499.0	214.8	21.2	30	NES*	34	ORG	5.49	0.90	0.13	0.28	0.07
HV-44	S-208	Bw	6.7	0.6	L	12.1	2	2.5	100.8	5.9	255.2	76.5	19.2	36	NES*	34	CL	4.89	0.67	0.14	0.07	0.08
HV-45	S-209	Os	7.1	0.3	L	75.4	21	115.0	857.1	47.0	83.4	153.5	6.4	30	NES*	34	ORG	9.48	1.64	0.32	1.53	0.14
HV-45	S-210	Os	6.9	0.1	L	62.7	4	48.4	360.0	31.8	88.9	117.5	15.5	35	NES*	35	ORG	5.49	0.99	0.17	0.64	0.09
HV-45	S-211	Bw	7.0	0.4	L	2.6	4	0.6	54.2	2.9	96.3	10.2	6.4	35	NES*	35	CL	2.64	0.55	0.19	0.12	0.15
HV-46	S-212	Os	5.4	0.3	L	84.0	33	34.0	312.3	71.4	293.2	95.5	16.8	35	NES*	35	ORG	0.75	0.44	0.22	0.38	0.29
HV-47	S-213	Os	4.9	0.6	L	79.3	42	40.0	682.1	162.2	524.4	110.2	10.0	35	NES*	35	ORG	2.25	0.82	0.43	1.13	0.35
HV-47	S-214	Os	4.7	0.1	L	73.3	26	15.0	23.1	39.6	279.9	28.8	13.3	35	NES*	35	ORG	1.35	0.39	0.09	0.10	0.10
HV-47	S-215	Os	4.8	0.3	L	56.2	11	3.6	7.8	49.6	199.7	54.0	15.3	35	NES*	35	ORG	1.60	0.32	0.11	0.02	0.11
HV-48	S-216	Os	5.0	0.3	L	84.2	27	15.0	18.7	71.0	399.4	170.3	15.7	35	NES*	35	ORG	1.15	0.39	0.09	0.07	0.10
HV-49	S-217	Os	4.4	0.3	L	90.0	40	31.0	229.0	23.3	1370.0	295.0	5.2	35	NES*	35	ORG	1.00	0.49	0.09	0.79	0.11
HV-49	S-218	Os	5.2	0.4	L	92.1	30	87.0	243.0	62.2	2850.0	104.0	6.7	35	NES*	35	ORG	1.30	0.53	0.18	0.43	0.19
HV-50	S-219	Os	5.0	0.3	L	90.9	30	71.0	216.0	53.2	4580.0	81.5	5.0	35	NES*	35	ORG	1.70	0.65	0.09	0.38	0.09
HV-50	S-220	Os	4.8	0.1	L	90.9	28	16.0	327.9	78.2	4385.7	136.3	21.4	35	NES*	35	ORG	1.00	0.38	0.09	0.22	0.11
HV-51	S-221	Os	5.3	0.1	L	85.1	50	40.0	130.0	50.3	3080.0	33.0	8.0	35	NES*	35	ORG	0.44	0.17	0.06	0.15	0.10
HV-52	S-222	Os	4.8	0.4	L	89.5	14	31.0	1045.4	55.4	553.1	53.8	11.6	35	NES*	35	ORG	1.30	0.57	0.28	0.77	0.29
HV-52	S-223	Os	4.7	0.3	L	89.7	23	25.0	349.7	26.6	4479.9	76.3	23.1	35	NES*	35	ORG	0.95	0.38	0.22	0.31	0.28
HV-52	S-224	Os	4.9	0.3	L	62.9	8	12.4	94.6	32.3	2994.5	38.2	38.0	35	NES*	35	ORG	1.30	0.49	0.20	0.07	0.22
HV-52	S-225	C	4.6	0.3	L	6.9	2	1.2	11.0	6.1	366.1	9.0	7.5	35	NES*	35	ORG	1.40	0.55	0.26	0.04	0.27
HV-53	S-226	Os	4.8	0.4	L	90.0	50	84.0	810.0	118.9	3747.9	237.0	11.0	35	NES*	35	ORG	1.25	0.59	0.35	0.61	0.37
HV-53	S-227	Os	4.6	0.3	L	91.7	22	14.8	326.1	19.1	2896.3	33.9	32.3	35	NES*	35	ORG	1.30	0.53	0.24	0.36	0.25
HV-53	S-228	Os	4.9	0.3	L	75.2	49	0.6	15.3	3.7	377.5	10.2	10.6	35	NES*	35	ORG	1.50	0.69	0.26	0.24	0.25
HV-53	S-229	C	4.6	0.3	L	9.8	5	0.6	203.0	34.2	5720.0	70.3	7.5	35	NES*	35	ORG	1.85	0.72	0.26	0.06	0.23
HV-54	S-230	Os	4.9	0.1	L	63.6	40	31.0	124.1	84.2	4577.2	90.2	21.2	35	NES*	35	ORG	0.65	0.29	0.29	0.38	0.42
HV-54	S-231	Os	4.9	0.1	L	71.3	54	25.0	124.1	84.2	4577.2	90.2	21.2	35	NES*	35	ORG	0.90	0.38	0.17	0.12	0.21
HV-54	S-232	Os	4.8	0.1	L	73.5	53	6.0	18.6	83.2	4001.2	67.3	19.4	35	NES*	35	ORG	1.10	0.41	0.13	0.08	0.15
HV-54	S-233	Os	4.8	0.1	L	63.6	42	37.0	26.3	51.5	4368.4	61.7	24.9	35	NES*	35	ORG	1.05	0.34	0.10	0.05	0.12
HV-55	S-234	Os	4.4	0.3	L	88.2	46	34.0	34.0	51.5	4368.4	61.7	24.9	35	NES*	35	ORG	0.80	0.36	0.12	0.16	0.12
HV-55	S-235	Os	4.9	0.1	L	92.4	30	12.0	47.0	24.6	2450.0	38.6	3.6	35	NES*	35	ORG	0.75	0.31	0.09	0.16	0.12
HV-55	S-236	Os	4.7	0.1	L	90.5	NES*	15.0	47.0	24.6	2450.0	38.6	3.6	35	NES*	35	ORG	0.90	0.37	0.11	0.13	0.13

* = Not Enough Sample

Total occur.

Total occur.	Number of species in plot	Plot
		1 2 3 4 5 19 26 41 10 15 7 45 37 24 29 32 34 33 45 29 49 39 48 39 45 43 21 29 34
		HV-1 HV-2 HV-3 HV-4 HV-5 HV-6 HV-7 HV-8 HV-9 HV-10 HV-11 HV-12 HV-13 HV-14 HV-15 HV-16 HV-17 HV-18 HV-19 HV-20 HV-21 HV-22 HV-23 HV-24 HV-25 HV-26 HV-27 HV-28
1	.	.
2	.	.
12	.	4 5
2	.	.
12'	+	.
11	+	+
24	+	+
1	.	.
21	3 2	1
2	.	.
1	.	.
2	.	.
1	.	.
2	.	.
2	.	.
2	.	.
3	.	.
9	.	1
3	.	1
2	.	.
33	+	.
18	.	.
14	+	+
3	.	+
1	.	.
1	.	.
4	.	1
1	.	.
1	.	+
4	.	.
1	.	.
12	.	2
17	.	.
3	+	.
6	.	+
1	+	.
1	.	.
8	.	.
2	.	.
6	1	1
1	.	.
2	.	.

Table 8. Happy Valley releve species data. Refer to Table 4 for the definitions of the Braun-Blanquet values.

	HV-1	HV-2	HV-3	HV-4	HV-5	HV-6	HV-7	HV-8	HV-9	HV-10	HV-11	HV-12	HV-13	HV-14	HV-15	HV-16	HV-17	HV-18	HV-19	HV-20	HV-21	HV-22	HV-23	HV-24	HV-25	HV-26	HV-27	HV-28															
<i>Oxytropis viscidula</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Papaver macounii</i>	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Parnassia kotzebuei</i>	6	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Parnassia palustris</i>	6	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	+	+										
<i>Pedicularis capitata</i>	17	+	+	.	+	+	.	.	1	.	.	.	+	.	1	.	+	.	.	.	.	.	1	.	.	+	.	.										
<i>Pedicularis groenlandica</i>	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pedicularis labradorica</i>	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pedicularis lanata</i>	11	+	+	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pedicularis langsdorffii</i>	4	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	1	+
<i>Pedicularis lapponica</i>	18	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1							
<i>Pedicularis sudetica</i>	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pedicularis verticillata</i>	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pentaphylloides floribunda</i>	7	.	.	.	.	.	.	.	.	.	.	.	2	+	+	+	+	1										
<i>Petasites frigidus</i>	16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pinguicula vulgaris</i>	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Platanthera obtusata</i>	4	1	+	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Poa glauca</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+									
<i>Poa</i> sp.	8	.	.	.	.	.	+	.	.	.	+	.	.	1	.	.	1	.	+										
<i>Polemonium acutiflorum</i>	7	.	.	.	.	.	.	.	.	.	.	+	1															
<i>Polemonium boreale</i>	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pyrola asarifolia</i>	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pyrola grandiflora</i>	13	.	.	1	2	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Ranunculus pallasii</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Rhododendron lapponicum</i>	7	1	1	.	.	1	.	.	1	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Rubus arcticus</i>	2	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Rubus chamaemorus</i>	20	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	1
<i>Rumex arcticus</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Salix alaxensis</i>	7	.	.	.	.	.	2	1	.	4	.	.	.	2	.	1	.	3										
<i>Salix arbusculoides</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Salix barclayi</i>	7	.	.	.	.	.	.	.	.	.	2	1	.	+	.	+	.	3										
<i>Salix brachycarpa</i> ssp. <i>niphoclada</i>	5	.	.	.	.	.	.	.	.	.	.	.	1	1	2	1												
<i>Salix fuscescens</i>	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Salix glauca</i>	16	2	.	.	1	.	.	.	.	.	.	.	4	+	3													
<i>Salix lanata</i>	13	+	.	3	3	.	.	.	.	.	+	.	2	.	4	.	.	2										
<i>Salix planifolia</i>	24	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Salix reticulata</i>	16	1	1	.	.	1	.	.	2	1	.	.	1	.	1	.	2	.	.	.	1	2	1	+	1	.	.	.															
<i>Saussurea angustifolia</i>	14	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	1	.	.	.	.	1	1	1				
<i>Saxifraga cernua</i>	1	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Saxifraga hieracifolia</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Saxifraga nelsoniana</i>	11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Senecio atropurpureus</i>	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Senecio lugens</i>	13	.	.	.	.	.	+	1	.	1	.	.	1	+	1	1												
<i>Shepherdia canadensis</i>	3	.	.	.	.	.	.	.	.	.	2	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Total occur.	1	4	6	6	17	3	6	11	4	18	5	5	7	16	1	4	1	2	8	7	1	6	13	1	7	2	20	1	7	2	5	6	16	13	24	16	14	1	2	11	10	13	3

Total occur.

Bryophytes

Abietinella abietina
Anastrophyllum minutum
Aneura pinguis
Anthelia juratzkana
Aulacomnium acuminatum
Aulacomnium pallastre
Aulacomnium turgidum
Barbilophozia binsteadii
Barbilophozia kunzeana
Barbilophozia sp.
Blepharostoma trichophyllum
Brachythecium coruscum
Brachythecium salebrosum
Bryum caespitium
Bryum neodanense
Bryum pseudotriquetrum
Calliergon giganteum
Calliergon stramineum
Campyllum polygamum
Campyllum stellatum
Campyllum zemliae
Catocopium nigrum
Ceratodon purpureus
Climacium dendrooides

Table 8. Happy Valley releve species data. Refer to Table 4 for the definitions of the Braun-Blanquet values.

Total occur.	HV-1	HV-2	HV-3	HV-4	HV-5	HV-6	HV-7	HV-8	HV-9	HV-10	HV-11	HV-12	HV-13	HV-14	HV-15	HV-16	HV-17	HV-18	HV-19	HV-20	HV-21	HV-22	HV-23	HV-24	HV-25	HV-26	HV-27	HV-28	
	<i>Ptilidium ciliare</i>	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	3	1	.	.	+	1	2
	<i>Ptilium crista-castrensis</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	+
	<i>Racomitrium lanuginosum</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12	<i>Rhytidium rugosum</i>	2	1	.	.	1	.	.	.	2	.	.	2	.	+	.	2	.	.	.	.	.	.	.	1	2	.	.	r
7	<i>Santonita uncinata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	<i>Sarmenthyllum sarmentosum</i>	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2	<i>Scapania paludosa</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	<i>Scorpidium scorpioides</i>	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.
20	<i>Sphagnum angustifolium</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	3	2	2
2	<i>Sphagnum aongstroemii</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9	<i>Sphagnum balticum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
11	<i>Sphagnum girgensohnii</i>	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	3	1
1	<i>Sphagnum imbricatum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
1	<i>Sphagnum lenense</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
5	<i>Sphagnum majus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4	<i>Sphagnum orientale</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3	<i>Sphagnum rubellum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
18	<i>Sphagnum</i> sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	<i>Sphagnum squarrosum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	<i>Sphagnum squarrosum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
2	<i>Sphagnum teres</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	.	.	.	.	.	.	.
7	<i>Sphagnum warnstorffii</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3	<i>Tetraplodon paradoxus</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	r	.	.
2	<i>Thuidium philiberti</i>	.	.	.	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2	<i>Thuidium recognitum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2	<i>Timmia austriaca</i>	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2	<i>Timmia norvegica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	<i>Tomentypnum nitens</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
31	<i>Tortella fogilis</i>	3	3	.	.	.	.	.	.	1	2	+	+	+	1	.	3	2	.	+	+	1	1	4	2	.	r	+	1
1	<i>Tortella fogilis</i>	1	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3	<i>Tortula ruralis</i>	3	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
1	<i>Tritomaria quinqueidentata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	<i>Warnstorfia exannulata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	<i>Unknown leafy liverwort</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
	Algae																												
1	<i>Nostoc commune</i>		.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Lichens																												
1	<i>Baeomyces placophyllus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
25	<i>Cetraria cucullata</i>	2	2	.	.	1	.	.	.	1	.	.	.	.	+	.	1	.	.	+	1	2	.	+	.	.	1	+	+
1	<i>Cetraria fastigiata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
17	<i>Cetraria islandica</i>	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1	.	.	.	+	1	+	+	.	.	.	.	+
1	<i>Cetraria laevigata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9	<i>Cetraria nivalis</i>	+	1	.	.	1	.	.	.	+	+	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.

Table 8. Happy Valley releve species data. Refer to Table 4 for the definitions of the Braun-Blanquet values.

	Total occur.	HV-1	HV-2	HV-3	HV-4	HV-5	HV-6	HV-7	HV-8	HV-9	HV-10	HV-11	HV-12	HV-13	HV-14	HV-15	HV-16	HV-17	HV-18	HV-19	HV-20	HV-21	HV-22	HV-23	HV-24	HV-25	HV-26	HV-27	HV-28	
<i>Cetraria tilexii</i>	3	+	+	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	2	.	.	.	.	.	.	+	+
<i>Cladonia arbuscula</i>	14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+
<i>Cladonia mitis</i>	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cladonia rangiferina</i>	16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	1	2	.	.	.	1	+	+	
<i>Cladonia amaurocraea</i>	14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	+	+	+
<i>Cladonia chlorophaea</i>	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cladonia cyanipes</i>	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Cladonia gracilis</i>	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Cladonia gracilis</i> var. <i>elongata</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
<i>Cladonia pocillum</i>	8	+	1	.	.	.	+	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cladonia pyxidata</i>	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cladonia</i> sp.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Cladonia sulphurina</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Collema ceraniscum</i>	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dactylina arctica</i>	23	+	+	.	.	.	+	.	.	.	+	.	.	.	.	.	.	+	.	.	.	+	1	.	.	.	.	+	+	+
<i>Lecanora epibryon</i>	3	1	+	.	.	.	.	.	.	.	1	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Masonhalea richardsonii</i>	7	1	+	.	.	.	+	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Nephroma arcticum</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Nephroma expallidum</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Ochrolechia frigida</i>	6	1	2	.	.	.	1	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pannaria pezizoides</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Peltigera aphthosa</i>	25	.	.	.	+	.	.	.	.	.	.	2	.	.	.	.	.	+	.	.	.	1	1	.	.	.	+	1	+	+
<i>Peltigera canina</i>	18	+	+	.	.	.	+	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	+
<i>Peltigera leucophlebia</i>	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.
<i>Peltigera malacea</i>	10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Peltigera praetextata</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Peltigera rufescens</i>	4	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Peltigera scabrosa</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pertusaria dactylina</i>	5	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pertusaria panyrga</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Physconia muscigena</i>	2	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Rinodina turfacea</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Stereocaulon alpinum</i>	5	+	.	.	.	.	2	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Thamnolia subuliformis</i>	8	2	2	.	.	.	1	.	.	.	1	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.

Table 8. Happy Valley releve species data. Refer to Table 4 for the definitions of the Braun-Blanquet values.

	Number of species in plot	HV-29	HV-30	HV-31	HV-32	HV-33	HV-34	HV-35	HV-36	HV-37	HV-38	HV-39	HV-40	HV-41	HV-42a	HV-42b	HV-43	HV-44	HV-45	HV-46	HV-47	HV-48	HV-49	HV-50	HV-51	HV-52	HV-53	HV-54	HV-55		
Vascular Plants																															
<i>Aconitum delphinifolium</i>		1	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Alnus viridis</i>		
<i>Andromeda polifolia</i>	+	.	.	.	+	1	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	2	2	.	.	.	.	.	1
<i>Androsace chamaejasme</i>		
<i>Anemone parviflora</i>		+	
<i>Anemone richardsonii</i>		
<i>Arctagrostis latifolia</i>	+	.	+	1	+	+	1	+	+	.	.	.	.	.	.	.	.	.	.	.
<i>Arctophila fulva</i>	1	1	1	.	.	2	.	.	.	.	.	.	.
<i>Arctostaphylos</i>	
<i>Arnica alpina</i>	+	
<i>Arnica lessingii</i>	+	
<i>Artemisia arctica</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Artemisia comata</i>	
<i>Artemisia glomerata</i>	
<i>Artemisia tilesii</i>	+	
<i>Aster sibiricus</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Astragalus umbellatus</i>	
<i>Betula glandulosa</i>	+	
<i>Betula nana</i>	2	2	1	2	3	3	2	3	3	2	3	2	3	.	2	+	.	+	.	.	.	.	2	2	.	2	2	.	.	2
<i>Bistorta bistortoides</i>	2	1	2	1	.	.	.	.	.	.	.	+	.	+	2	2	.	2	2	.	.	.	.	.	.	.	.	.	.	.
<i>Bistorta vivipara</i>	+	+	
<i>Boschniakia rossica</i>	
<i>Bromopsis pumelliana</i>	
<i>Bupleurum triradiatum</i>	
<i>Calamagrostis canadensis</i>	2	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Calamagrostis inexpectata</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Calamagrostis purpurascens</i>	
<i>Calamagrostis</i> sp.	
<i>Cardamine digitata</i>	
<i>Carex aquatilis</i>	3	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>Carex bigelowii</i>	.	.	4	2	.	+	.	.	.	.	.	1	.	+	3	+	.	1	1	.	.	.	.	.	.	.	.	.	.	.
<i>Carex capillaris</i>	
<i>Carex chondrorhiza</i>	2	.	1	2	3	.	.	2	+	.	
<i>Carex membranacea</i>	
<i>Carex podocarpa</i>	1	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Carex rotundata</i>	3	.	1	+	1	2	1	3	1	
<i>Carex saxatilis</i>	
<i>Carex scirpoides</i>	
<i>Carex</i> sp.	
<i>Carex vaginata</i>	

	HV-29	HV-30	HV-31	HV-32	HV-33	HV-34	HV-35	HV-36	HV-37	HV-38	HV-39	HV-40	HV-41	HV-42a	HV-42b	HV-43	HV-44	HV-45	HV-46	HV-47	HV-48	HV-49	HV-50	HV-51	HV-52	HV-53	HV-54	HV-55
Cassiope tetragona	1	.	2	1	.	.	.	.	.	.	+	.	1	2	2	.	1	1	.	.	.	.	.	.	.	.	.	.
Castilleja caudata
Chamaedaphne calyculata	+	+	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Comarum palustre
Delphinium chamissonis	1	.	.	.	.	.	.	.	.	.	.	.	.
Dodecatheon frigidum
Draba sp.
Dryas integrifolia	.	.	3	.	.	.	.	.	.	.	.	.	.	+	.	.	3	3	.	.	.	.	.	.	.	.	.	.
Elymus trachycaulus ssp. violaceus
Empetrum nigrum	1	+	.	1	.	.	.	+	.	.	+	+	+	+	+	+	+	+	.	.	.	+	.	.	.	.	+
Epilobium latifolium	2	2	.	.	.	.	.	.	.	.	.	.
Equisetum arvense	.	.	2	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Equisetum scirpoides
Equisetum sp.
Equisetum variegatum
Eriophorum angustifolium	4	+	+	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Eriophorum scheuchzeri	+	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	1	+
Eriophorum triste	1	1	.	.	.	.	.	.	.	.
Eriophorum vaginatum	4	2	+	3	.	.	1	r	.	+	4	+	+	2	.	2	+	1	.	.	.	.	.	.	.	.	.	.
Festuca altaica
Festuca rubra
Gentian sp.
Gentiana prostrata	+
Hedysarum alpinum
Hedysarum mackenzii
Hyperzia selago ssp. appressa
Juncus biglumis	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Kobresia sibirica
Lagotis glauca	2	3	+	.	.	.	2	2	.	3	2	3	+	2	2	.	r											

Appendix 1. Field descriptions of soils from notes.

Relevé HV-01 Soil Profile Description			
Location:	Fluvial Terrace		
Description by:	A. Gallant		
Sample Date:	7/18/94	Sample Time:	15:30
Classification:			
Parent Material:	Stabilized alluvium, sands and cobbles		
Geomorphic Surface:	Flat centered polygons		
Elevation:	900 ft	Slope:	0°
		Aspect:	Flat
Vegetation:	Dry <i>Dryas integrifolia</i> , <i>Arctous rubra</i> , <i>Salix glauca</i> , <i>Lupinus arcticus</i> dwarf-shrub tundra		

Horizon:	Description:	
Oa	0-9 cm	Sample S-68
	Very dark brown (10 YR 2/2) silt. Weak, medium, subangular blocky breaking to moderate, fine, granular structure; 0% gravel; slightly sticky, slightly plastic consistence (wet); many very fine roots, common fine roots; abrupt, smooth boundary	
B	9-41 cm	Sample S-69
	Very dark brown to gray brown (10 YR 3/1.5) sandy loam. Weak, medium, subangular blocky breaking to moderate, very fine, granular structure; 10% gravel; slightly sticky, slightly plastic consistence (wet); common fine roots; cobbles up to 15 cm concentrated at top of layer, also interspersed throughout layer.	
C	41+ cm	no sample
	cobble layer. Notes: thaw is greater than 41 cm, but cobble layer prohibits further digging or probing.	

Relevé HV-02 Soil Profile Description

Location:	Second fluvial terrace nearer to road than runway		
Description by:	A. Gallant		
Sample Date:	7/18/94	Sample Time:	
Classification:			
Parent Material:	Alluvial sands, gravels, cobbles		
Geomorphic Surface:	Irregular microrelief		
Elevation:	900 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Dry <i>Dryas integrifolia</i> , <i>Lupinus arcticus</i> , <i>Rhododendron lapponicum</i> , <i>Cetraria cucullata</i> dwarf-shrub, forb tundra		

Horizon:	Description:	
Oa	0-6 cm	Sample S-70
	Black (10YR 2/1) Silt. Weak, fine, subangular blocky structure; 0% gravel; slightly sticky, slightly plastic consistence (wet); many very fine roots, common fine roots; abrupt, wavy boundary.	
B	6-26 cm	Sample S-71
	Very dark gray (10 YR 3/1) sandy loam. Moderate, medium, subangular blocky breaking to weak, fine, subangular blocky structure. <10% gravel; slightly sticky and slightly plastic consistence (wet); common fine roots, common medium roots; few cobbles (to 10 cm in diameter) in layer.	
C	26+ cm	cobble layer.

Relevé HV-03 Soil Profile Description

Location:	small pond, 100 m east of Dalton Highway, just north of Happy Valley camp		
Description by:	S. Walker		
Sample Date:	7/21/94	Sample Time:	
Classification:			
Parent Material:	Pond organic		
Geomorphic Surface:	Pond		
Elevation:	900 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Aquatic <i>Comarum palustre</i> , <i>Sparganium hyperboreum</i> , <i>Calliergon giganteum</i> forb marsh		

Horizon:	Description:	
Oi	0-40 cm	Sample S-72
	Black (10 YR 2/2) fibric material consisting of roots of <i>Sparganium hyperboreum</i> .	
C	40+ cm	No sample
	Rocky, cobbly horizon, stream channel.	

Relevé HV-04 Soil Profile Description

Location:	Floodplain, 150 m west of runway near Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/21/94	Sample Time:	
Classification:			
Parent Material:	Stabilized alluvium, sands and gravel		
Geomorphic Surface:	Gently rolling or irregular microrelief		
Elevation:	900 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Moist <i>Alnus viridis</i> , <i>Salix lanata</i> , <i>Equisetum arvense</i> , <i>Climaceum dendroides</i> low shrubland.		

Horizon:	Description:	
Oe	0-4 cm	Sample S-73
	Very dark grayish brown to very dark brown (10YR 2.5/2) hemic material composed of stems and decomposing leaves and very fine roots; abrupt, smooth, boundary.	
A1	4-14 cm	Sample S-74
	Very dark grayish brown to very dark brown silt loam. Weak, fine, granular structure. 0% gravel; slightly sticky and slightly plastic consistence; many very fine and fine roots, many medium roots, common coarse roots; abrupt, smooth boundary.	
A2	14-21 cm	Sample S-75
	Very dark brown (10 YR 2/2) loam. Weak, medium, granular structure. 0% gravel; slightly sticky and slightly plastic consistence; common very fine, fine, and medium roots; abrupt, smooth boundary.	
B	21-30 cm	Sample S-76
	Very dark grayish brown (10 YR 3/2) sandy loam. Weak, fine, subangular blocky structure. 0% gravel; slightly sticky and slightly plastic consistence; many very fine and fine roots, common medium roots; clear, wavy boundary. Notes: Indistinct banding of organic materials from flooding events apparent.	
C	30-38+ cm	Sample S-77
	Very dark grayish brown (10YR 3/2) loamy sand. Weak, medium, granular structure. 0% gravel; nonsticky and nonplastic consistence (wet); common very fine and fine roots.	
permafrost	38+	

Relevé HV-05 Soil Profile Description

Location:	Floodplain on creek, very shrubby, 200 m west of runway, at bottom of hill below road.		
Description by:	A. Gallant and N. Auerbach		
Sample Date:	7/21/94	Sample Time:	15:30
Classification:			
Parent Material:	Stabilized alluvial sands and gravels		
Geomorphic Surface:	irregular microrelief		
Elevation:	900 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Moist <i>Alnus viridis</i> , <i>Salix lanata</i> , <i>Vaccinium uliginosum</i> , low shrubland.		

Horizon:	Description:	
Oi	0-4 cm	Sample S-78
	Very dark grayish brown (10 YR 3/2) fibric material composed of litter (dead leaves) and roots (<i>Alnus viridens</i> , <i>Betula nana</i>); many fine and very fine roots, common medium roots; abrupt, smooth boundary.	
Oe	4-15 cm	Sample S-79
	Black (10 YR 2/1) hemic material. 0% gravel, many fine and very roots, common medium roots; abrupt, smooth boundary.	
permafrost	15 cm	
A	15-20 cm	Sample S-86
	Black (10 YR 2/1) silt. Undetermined structure (frozen soil). 0% gravel; nonsticky and nonplastic consistence (wet); common medium and coarse roots, undetermined concentration of very fine and fine roots because of frozen consistence, possibly many very fine roots; abrupt, smooth boundary.	
B	20-28+ cm	Sample S-81
	Dark gray (10 YR 4/1) loam. Weak, fine, subangular blocky breaking to moderate, fine, granular structure. 0% gravel; slightly sticky and slightly plastic consistence (wet); undetermined concentration of roots because of frozen consistence; common, fine yellowish red (5 YR 5/8) mottles.	

Relevé HV-06 Soil Profile Description

Location:	Fluvial Terrace, 100m west of runway just east across Dalton Highway from HV camp		
Description by:	A. Gallant and N. Auerbach		
Sample Date:	7/21/94	Sample Time:	14:31
Classification:			
Parent Material:	Stabilized alluvium (sands and gravel)		
Geomorphic Surface:	featureless, less than 20 frost scars		
Elevation:	900 ft	Slope:	0°
		Aspect:	Flat
Vegetation:	Dry <i>Dryas integrifolia</i> , <i>Lupinus arcticus</i> , <i>Stereocaulon alpinum</i> , <i>Tomentypnum nitens</i> dwarf-shrub, forb tundra		

Horizon:	Description:	
surface moss	0-0.5 cm	No sample
	Abrupt, smooth boundary.	
Oa1	0.5-2 cm	Sample S-82
	Black (10YR 2/2). Less than 10% gravel; abrupt, smooth boundary. Many fine and very fine roots and cobbles to 14 cm in diameter.	
A	2-4 cm	Sample S-83
	(10YR 2.5/1). 75% gravel, nonsticky and slightly plastic consistence (wet). Silty loam texture with abrupt, smooth boundary. Many fine and very fine roots and cobbles to 14 cm in diameter.	
Oa2	4-6 cm	Sample S-84
	Black (10 YR 2/1). 75% gravel, nonsticky, non plastic consistence (wet). Abrupt, smooth boundary. Many fine and very fine roots and cobbles to 14 cm in diameter.	
B2	6-30+ cm	Sample S-85
	Very dark gray (10YR 3/1). Weak, medium, granular structure with 75% gravel. Nonsticky, nonplastic consistence (wet); sandy loam texture with abrupt, smooth boundary. Common fine and very fine roots with cobbles to 21 cm in diameter.	
	30+ cm	very stony, didn't dig past this point, didn't reach permafrost

Relevé HV-07 Soil Profile Description

Location:	Happy Valley, river bar		
Description by:	A. Gallant		
Sample Date:	7/18/94	Sample Time:	9:30
Classification:			
Parent Material:	Alluvial gravels and sand		
Geomorphic Surface:	Stony surface		
Elevation:	950 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Dry <i>Epilobium latifolium</i> , <i>Hedysarum alpinum</i> , <i>Salix alaxensis</i> forb barren		

Horizon:	Description:	
C	depth not measurable	Sample S-86
	Very dark gray-brown (2.5 YR 3/2). Gravel bar with cobbles up to 50 cm in diameter. Single grain structure; nonsticky, nonplastic consistence (wet). Sandy texture. Soil not described.	

Relevé HV-08 Soil Profile Description

Location:	Happy Valley, river bar		
Description by:	A. Gallant		
Sample Date:	7/18/94	Sample Time:	10:00
Classification:			
Parent Material:	Alluvial gravels and sand		
Geomorphic Surface:	Stony surface		
Elevation:	900 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Dry <i>Castilleja caudata</i> , <i>Hedysarum alpinum</i> forb barren		

Horizon:	Description:	
C	depth not measurable	Sample S-87
	Black (2.5 YR 2/2). Gravel bar with cobbles up to 50 cm in diameter. Single grain structure; nonsticky, nonplastic consistence (wet). Sandy texture. Soil not described.	

Relevé HV-09 Soil Profile Description

Location:	Edge of pond by gravel pit		
Description by:	A. Gallant		
Sample Date:	7/18/94	Sample Time:	10:45
Classification:			
Parent Material:	Lacustrine organic deposits		
Geomorphic Surface:	Featureless		
Elevation:	950 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Wet <i>Carex saxatilis</i> , <i>Carex aquatilis</i> graminoid meadow		

Horizon:	Description:	
Oe	0-14 cm	Sample S-88
	Black (10 YR 2/1). Weak, medium, platy structure with 0% gravel. Nonsticky, nonplastic consistence (wet) with silky organic sand texture; abrupt, smooth boundary. 10% silt, 20% plant fibers after rubbing (sedge, roots, leaves)	
A1	14-25 cm	Sample S-89
	Very dark gray (10 YR 3/1). Massive structure with 0% gravel. Slightly sticky, nonplastic consistence (wet). Loamy sand texture with clear, smooth boundary. Many very fine roots.	
A2	25-47 cm	Sample S-90
	Black (5 YR 2.5/1). Weak, fine subangular blocky structure with 0% gravel. Slightly sticky, slightly plastic consistence (wet). Silty loam texture with many very fine roots. Permafrost boundary at 47 cm depth.	

Relevé HV-10 Soil Profile Description

Location:	Fluvial terrace near old campsite		
Description by:	A. Gallant		
Sample Date:	7/18/94	Sample Time:	12:00
Classification:			
Parent Material:	Stabilized Alluvium		
Geomorphic Surface:	Featureless		
Elevation:	950 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Dry <i>Dryas integrifolia</i> , <i>Lupinus arcticus</i> , <i>Rhododendron lapponicum</i> , <i>Arctous rubra</i> dwarf-shrub, forb tundra		

Horizon:	Description:	
Oi	0-2 cm	No sample
	Abrupt, smooth boundary; dead leaves, loose stems. Layer too thin to sample	
Oa	2-8 cm	Sample S-91
	Very dark brown (7.5 YR 2/2). Abrupt, wavy boundary; sapric organic with less than 2% fibers after rubbing.	
B1	8-18 cm	Sample S-92
	Mixed horizon with mottles and organic inclusions. Dark yellow-brown mottles (10 YR 4/6) from 0.5-1 cm, very dark gray-brown (10 YR 3/1.5) dominant matrix, black organic inclusions common 1-2 cm (10 YR 2/1). Weak, fine, subangular blocky structure with 0% gravel. Slightly sticky, slightly plastic consistence (wet); loam texture. Abrupt, smooth boundary; many fine roots.	
B2	18-30 cm	Sample S-93
	Very dark gray-brown (10 YR 3/2). Moderate, medium, subangular blocky structure breaking into moderate medium granular structure. Slightly sticky, slightly plastic consistence (wet). Loam texture with abrupt, smooth boundary; few very fine roots.	
B3	30-47 cm	Sample S-94
	Very dark gray (10 YR 3/1). Weak, medium subangular blocky structure. Nonsticky, nonplastic consistence (wet); sand texture.	
Cobble layer	47+ cm	No sample

Relevé HV-11 Soil Profile Description

Location:	Floodplain, dry scrub area		
Description by:	A. Gallant		
Sample Date:	7/18/94	Sample Time:	14:00
Classification:			
Parent Material:	Stabilized Alluvium (sands and gravels)		
Geomorphic Surface:	Gently rolling or irregular microrelief		
Elevation:	950 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Dry <i>Salix alaxensis</i> , <i>Shepherdia canadensis</i> , <i>Arctous rubra</i> tall shrubland		

Horizon:	Description:	
O	0-2 cm	No sample
	Very dark brown (10 YR 2/2). 0% gravel with abrupt, smooth boundary. Live moss, plant litter, many very fine roots, many fine roots, many medium roots.	
A	2-6 cm	Sample S-95
	Very dark gray (10 YR 3/1). Moderate, fine, granular structure with 0% gravel. Slightly sticky, slightly plastic consistence (wet). Sandy loam texture with abrupt, smooth boundary. Common fine roots, many very fine roots, common medium roots.	
C1	6-9 cm	No sample
	Black (5 YR 2.5/1.5). Single grain structure. Nonsticky, nonplastic consistence (wet). Sandy texture with abrupt, wavy boundary. Many very fine roots, common fine roots, common medium roots. Layer too thin to sample.	
C2	9-73 cm	Sample S-96
	Very dark gray-brown (2.5 YR 3/2). Weak, medium, subangular blocky structure breaks into moderate, fine granular. Slightly sticky, slightly plastic consistence (wet). Sandy loam texture with many very fine rocks, many fine roots, common medium roots, common coarse roots.	
Permafrost	73 cm	No sample

Relevé HV-12 Soil Profile Description

Location:	Water track on shoulder of bluff over looking Sag. river; 2 km south of HV camp		
Description by:	A. Gallant		
Sample Date:	7/19/94	Sample Time:	
Classification:			
Parent Material:	Undifferentiated hillslope colluvium		
Geomorphic Surface:	Well-developed hillslope water track		
Elevation:	1050 ft	Slope:	15°
		Aspect:	E
Vegetation:	Wet <i>Salix glauca</i> , <i>Petasites frigidus</i> , <i>Equisetum arvense</i> low shrubland		

Horizon:	Description:	
Oe	0-21 cm	Sample S-97
	Black (10 YR 2/1). Massive structure with 0% gravel. Loam texture with abrupt, smooth boundary. Composed of sedge, sedge roots, willow roots with many very fine, fine, medium and coarse roots. Red mottles - few and large in Oe layer (7.5 YR 3/3)	
O/B	21-40+ cm	Sample S-98
O	Black (10 YR 2/1). Massive structure with 0% gravel. Slightly sticky, slightly plastic consistence (wet). Loam texture.	
B	Very dark gray-brown (10 YR 3/2). Massive structure with 0% gravel. Slightly sticky, slightly plastic consistence (wet). Silty loam texture.	
Permafrost	40 cm	No sample

Relevé HV-13 Soil Profile Description

Location:	Bluff overlooking Sag. river; 1/3 mile north of access road		
Description by:	A. Gallant		
Sample Date:	7/19/94	Sample Time:	
Classification:			
Parent Material:	Colluvium and glacial till		
Geomorphic Surface:	Gelifluction lobes		
Elevation:	1000 ft	Slope:	30°
		Aspect:	E
Vegetation:	Moist <i>Arctous rubra</i> , <i>Salix glauca</i> , <i>Lupinus arcticus</i> , <i>Salix lanata</i> , <i>Hylocomium splendens</i> forb, low shrubland		

Horizon:	Description:	
Oi	0-2 cm	No sample
Oe	2-8 cm	Sample S-100
	Black (10 YR 2/1)	
Oa/B	8-22 cm	Samples S-99, S-101, S-102
Oa	Black (10 YR 2/1). Weak, fine, subangular blocky structure with 50% gravel. Nonsticky, nonplastic consistence (wet). Silty texture with clear, wavy boundaries. Many fine roots, common very fine roots, few medium roots.	
B	Very dark gray-brown (10 YR 3/2). Weak, fine, subangular blocky structure with 50% gravel. Slightly sticky, slightly plastic consistence (wet). Silty loam texture with clear, wavy boundaries. Many fine roots, common very fine roots, few medium roots.	
B	22-40+ cm	No sample
	Very dark gray-brown (10 YR 3/2). Weak, fine, subangular blocky structure that breaks to weak, very fine, granular structure. 75% gravel; slightly sticky, slightly plastic consistence (wet). Silty loam texture.	

Relevé HV-14 Soil Profile Description

Location:	Floodplain of Sag. river, .3 miles north of access road		
Description by:	A. Gallant		
Sample Date:	7/19/94	Sample Time:	
Classification:			
Parent Material:	Active alluvial sands and gravels		
Geomorphic Surface:	stony surface		
Elevation:	950 ft	Slope:	0°
		Aspect:	Flat
Vegetation:	Dry <i>Salix alaxensis</i> , <i>Castilleja caudata</i> , <i>Hedysarum alpinum</i> low shrub, forbland		

Horizon:	Description:
C	Sample S-103 Very dark gray-brown (2.5 YR 3/2). Sample is surface sand. Surface is composed of sands, gravels, and cobbles up to 40 cm in diameter.

Relevé HV-15 Soil Profile Description

Location:	Bluff overlooking Sag. river north of access road, 2 km south of the Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/19/94	Sample Time:	
Classification:			
Parent Material:	Glacial till, undifferentiated. hillslope colluvium		
Geomorphic Surface:	Gelifluction lobes		
Elevation:	1000	Slope:	30°
		Aspect:	E
Vegetation:	Moist <i>Arctous rubra</i> , <i>Salix glauca</i> , <i>Salix lanata</i> , <i>Abietinella abietina</i> low shrubland		

Horizon:	Description:
Oi	0-2 cm | Sample S-104 Dark brown (7.5 YR 3/2). Abrupt, smooth boundary. Composed of moss (e.g. <i>Abietinella abietina</i>), many very fine and fine roots.
Oe	2-10 cm | Sample S-105 Dark red-brown (5 YR 2.5/1.5). Abrupt, smooth boundary. Composed of moss (e.g. <i>Abietinella abietina</i>), many very fine and fine roots.
Oa/B	10-37 cm | Sample S-106
Oa	Black (10 YR 2/1). Weak, fine, subangular blocky structure with 25% gravel. Nonsticky, nonplastic consistence (wet). Silty texture.
B	Very dark gray-brown (10 YR 3/2). Weak, fine, subangular blocky structure with 25% gravel. Slightly sticky, plastic consistence (wet). Clay loam texture.
B	37+ cm Sample S-107 Dark brown (10 YR 3/3). Weak, fine, subangular blocky structure. 25% gravel; slightly sticky, plastic consistence (wet). Clay loam texture; deeper soil description prevented by rocks.

Relevé HV-16 Soil Profile Description
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Location:	Rocky floodplain of Sag. river, north of access road, 2 km south of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/19/94	Sample Time:	
Classification:			
Parent Material:	Active alluvial sands and gravels		
Geomorphic Surface:	stony surface		
Elevation:	1000	Slope:	0°
Aspect:	Flat		
Vegetation:	Dry <i>Salix alaxensis</i> , <i>Castilleja caudata</i> , <i>Hedysarum alpinum</i> forbland		

Horizon:	Description:
C	Sample S-108
	Very dark gray-brown (2.5 YR 3/2). Surface to unknown depth is sands, gravels and cobbles up to 30 cm in diameter. Sample taken of surface sands.

Relevé HV-17 Soil Profile Description

Location:	Snowbed in bluff overlooking Sag. River, south of access road		
Description by:	A. Gallant		
Sample Date:	7/19/94	Sample Time:	
Classification:			
Parent Material:	Undifferentiated hillslope alluvium and glacial till		
Geomorphic Surface:	Gelifluction features		
Elevation:	950 ft	Slope:	30°
		Aspect:	E
Vegetation:	Moist <i>Tomentypnum nitens</i> , <i>Dryas integrifolia</i> , <i>Lupinus arcticus</i> , <i>Cassiope tetragona</i> , dwarf-shrub, forb tundra (snowbed)		

Horizon:	Description:	
Oi	0-2 cm	No sample
	Layer too thin to sample. Composed of moss <i>Tomentypnum nitens</i> .	
Oe	2-4 cm	No sample
	Very dark brown (7.5 YR 2/2). Nonsticky, nonplastic consistence (wet); abrupt, wavy boundary. Layer too thin to sample.	
Oa	4-9 cm	Sample S-109
	Black (10 YR 2/1). Moderate, fine, subangular blocky structure that breaks to moderate, fine, granular structure. Silty texture with clear, wavy boundary. Many very fine to fine roots.	
A/B	9-35 cm	Sample S-110 A and B horizons are mixing in this layer probably due to downslope movement. Rocks showing buildup of carbonates on undersides.
A	Very dark brown (10 YR 2/2). Weak, fine, subangular blocky structure that breaks to moderate, fine granular structure. 25% gravel. Slightly sticky, slightly plastic consistence (wet); sandy loam texture. Many fine to very fine roots.	
B	Brown (10 YR 4.5/3). Weak, very fine, subangular blocky structure that breaks to moderate, fine, granular structure. 25% gravel. Sticky, plastic consistence (wet); clay loam texture.	
C	35+ cm	Sample S-111
	Very dark gray-brown to brown (10 YR 2.5/2). Weak, medium, granular structure with greater than 75% gravel. Slightly sticky, slightly plastic consistence (wet); clay loam texture. Depth undetermined because there were too many rocks to dig further.	

Relevé HV-18 Soil Profile Description

Location:	Floodplain south of access road		
Description by:	A. Gallant		
Sample Date:	7/19/94	Sample Time:	
Classification:			
Parent Material:	Stabilized alluvium sand		
Geomorphic Surface:	Irregular microrelief		
Elevation:	950 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Moist <i>Salix alaxensis</i> , <i>Salix lanata</i> , <i>Campylium stellatum</i> , <i>Equisetum arvense</i> , <i>Hedysarum alpinum</i> low shrubland		

Horizon:	Description:	
Oi	0-1 cm	No sample
	Layer too thin to sample, composed of moss (<i>Campylium stettatum</i>)	
Oe	1-5 cm	No sample
	Very dark gray-brown to brown (10 YR 2.5/2). Abrupt, smooth boundary; primarily moss. Layer too thin to sample. Deposition of 1 cm thick layer of silt at the top of this layer (from flood) (10 YR 3/1).	
Bw	5-68 cm	Sample S-112
	(10 YR 3/1). Massive structure with 0% gravel. Slightly sticky, slightly plastic consistence (wet); sandy loam texture with many very fine to fine roots.	
Permafrost	68 cm	No sample

Relevé HV-19 Soil Profile Description

Location:	East-facing river bluff of Sag. River; about 2 km south of Happy Valley Camp		
Description by:	A. Gallant		
Sample Date:	7/19/94	Sample Time:	
Classification:			
Parent Material:	Colluvium with glacial till		
Geomorphic Surface:	Gelifluction lobes		
Elevation:	950 ft	Slope:	30°
		Aspect:	E
Vegetation:	Dry <i>Salix glauca</i> , <i>Festuca altaica</i> , <i>Arctous rubra</i> , shrubland		

Horizon:	Description:	
Oi	0-6 cm	No sample
	Clear, wavy boundary. Layer composed of dead leaves, woody stems, and dead mosses.	
Oa/A	6-44 cm	Sample S-113
	Because of downslope movement of materials, this layer is a mix of soils from two horizons. Many very fine, fine, medium and coarse roots.	
O	Dark red-brown (5 YR 2.5/2). Abrupt, wavy boundary. Too much organic material to classify structure and consistence.	
A	Very dark gray (10 YR 3/1). Weak, very fine, subangular blocky structure breaks to weak, very fine, granular structure; 25% gravel. Nonsticky, nonplastic consistence (wet) with loamy sand texture.	
C	44-76+ cm	Sample S-114
	Very dark gray-brown (10 YR 3/2). Weak, very fine, subangular blocky structure breaks to weak, very fine, granular structure; 75% gravel. Slightly sticky, slightly plastic consistence (wet) with sandy clay texture. Many very fine and fine roots. Rocks prevent any deeper soil description.	

Relevé HV-20 Soil Profile Description

Location:	Hillcrest of toposequence; about 1 km north of Happy Valley Camp		
Description by:	A. Gallant		
Sample Date:	7/20/94	Sample Time:	
Classification:			
Parent Material:			
Geomorphic Surface:	Featureless		
Elevation:	1000 ft	Slope:	2°
Aspect:	N		
Vegetation:	Moist , <i>Hylocomium splendens</i> , <i>Eriophorum vaginatum</i> , <i>Betula nana</i> , tussock-graminoid and dwarf-shrub tundra		

Horizon:	Description:	
Oi	0-6 cm	Sample S-115
	Yellow brown (10 YR 5/8). Abrupt, smooth boundary. Loose mat of mosses including <i>Aulacomnium turgidum</i> . Very fine sedge roots.	
Oe	6-14 cm	Sample S-116
	Dark brown (7.5 YR 3/4). Abrupt, smooth boundary. Composed of compressed mat of and sedge roots.	
Oa	14-26 cm	Sample S-117
	(10 YR 2/2). Abrupt, smooth boundary. Composed of decomposed mosses and sedge roots.	
Permafrost	26 cm	
Bs	26-28 cm	Sample S-118
	Very dark brown (10 YR 3/4). Massive structure with 0% gravel. Sticky, plastic consistence (wet). Silty clay loam texture with abrupt, smooth boundary. Has humic layer at top. Difficult to get pure sample without contamination from Bw layer.	
Bw	28+ cm	Sample S-119
	Dark gray-brown (2.5 YR 4/2). Massive structure with 0% gravel. Sticky, plastic consistence (wet). Silty clay loam texture. Hard to get sample without contamination from Bs layer.	

Relevé HV-21 Soil Profile Description

Location:	Shoulder of toposequence; about 1 km north of Happy Valley Camp		
Description by:	A. Gallant		
Sample Date:	7/20/94	Sample Time:	11:15
Classification:			
Parent Material:	hillslope colluvium		
Geomorphic Surface:	featureless		
Elevation:	1000 ft	Slope:	7°
		Aspect:	N
Vegetation:	Moist <i>Hylocomium splendens</i> , <i>Carex Bigelowii</i> , <i>Eriophorum vaginatum</i> , <i>Cassiope tetragona</i> , <i>Salix planifolia</i> tussock-graminoid, dwarf- shrub tundra		

Horizon:	Description:	
Oi	0-4 cm	Sample S-120
	(10 YR 5/4). Abrupt, smooth boundary. Composed of a loose mat of <i>Sphagnum</i> and sedge roots.	
Oe	4-12 cm	Sample S-123
	Dark brown (7.5 YR 3/2). Abrupt, smooth boundary. Composed of decomposing <i>Sphagnum</i> and sedge roots.	
Oa	12-20 cm	Sample S-121
	Black (10 YR 2/1). Abrupt, smooth boundary. Composed of decomposing <i>Sphagnum</i> and sedge roots.	
Bw	20+ cm	Sample S-122
	Very dark gray-brown (10 YR 3/2). Massive structure with less than 10% gravel; 1 piece up to 2 cm in diameter. Sticky, plastic consistence (wet). Silty clay loam texture; common fine mottles in top 1 cm of layer (7.5 YR 4/6).	
permafrost	20 cm	

Relevé HV-22 Soil Profile Description

Location:	Side slope of toposequence; about 1 km north of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/20/94	Sample Time:	
Classification:			
Parent Material:	Colluvium and till		
Geomorphic Surface:	Gelifluction lobes		
Elevation:	975 ft	Slope:	20°
Aspect:	N		
Vegetation:	Moist <i>Cassiope tetragona</i> , <i>Dryas integrifolia</i> , <i>Salix glauca</i> , <i>Hylocomium splendens</i> , <i>Betula nana</i> , <i>Vaccinium uliginosum</i> , <i>Drepanocladus uncinatus</i> , <i>Ptilidium ciliare</i> low and dwarf-shrub tundra.		

Horizon:	Description:	
Oe	0-2 cm	No sample
	Black (10 YR 2/2). Composed of slightly compressed leaf litter, mosses (<i>Drepanocladus uncinatus</i> , <i>Ptilidium ciliare</i>) and fine roots.	
Oa	2-7 cm	Sample S-124
	Black (5 YR 2.5/1.5). Less than 10% gravel. Highly decomposed.	
A	7-12 cm	Sample S-125
	Black (5 YR 2.5/1.5). Weak, fine, subangular blocky structure breaks into weak, very fine granular structure; less than 10% gravel. Slightly sticky, slightly plastic consistence (wet). Silty loam texture.	
B	12-42+ cm	Sample S-126
	Dark gray-brown (10 YR 4/2). Weak, fine, subangular blocky structure breaks into weak, very fine granular structure; 25% gravel. Sticky, plastic consistence (wet) with loam texture. Mottles are common and fine in size.	
Permafrost	86 cm	

Relevé HV-23 Soil Profile Description

Location:	Footslope of north-facing toposequence, 1 km north of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/20/94	Sample Time:	13:45
Classification:			
Parent Material:	Hillslope colluvium		
Geomorphic Surface:	Gelifluction lobes		
Elevation:	950 ft	Slope:	5°
Aspect:	N		
Vegetation:	Moist <i>Tomentypnum nitens</i> , <i>Dryas integrifolia</i> , <i>Salix glauca</i> , <i>Equisetum arvense</i> horsetail, low shrubland		

Horizon:	Description:
Oi	0-4 cm | Sample S-127
	(10 YR 2/2). Abrupt, smooth boundary; comprised of loose mat of moss, primarily <i>Tomentypnum nitens</i> and <i>Equisetum arvense</i> and roots.
Oe	4-8 cm | Sample S-128
	Very dark brown (10 YR 2/1.5). Abrupt, smooth boundary; comprised of decomposing roots and mosses. About 25% fiber after rubbing.
Oa	8-16 cm | Sample S-129
	Black (10 YR 2/1). Abrupt, smooth boundary; less than 5% fiber content after rubbing.
Bw	16-40 cm | Sample S-130
	Dark gray-very dark gray (10 YR 4.5/1). Massive structure with 10% gravel. Where there are concentrations of organic matter the structure is moderate, fine and granular. Sticky, plastic consistence (wet); clay loam texture. Many very fine, common fine, few medium roots. Gravel and cobbles up to 10 cm in diameter concentrated in top of layer but spread throughout common, fine, distinct mottles. Mottles are yellowish-brown (10 YR 5/6).
Permafrost	40 cm

Relevé HV-24 Soil Profile Description

Location:	Toeslope of toposequence; about 1 km north of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/20/94	Sample Time:	
Classification:			
Parent Material:	Stabilized fine-textured alluvium		
Geomorphic Surface:	Floodplain		
Elevation:	950 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Moist <i>Equisetum arvense</i> , <i>Salix lanata</i> , <i>Petasites frigidus</i> , <i>Dodecatheon frigidum</i> , <i>Climacium dendroides</i> low shrubland (riparian)		

Horizon:	Description:	
Oe	0-5 cm	Sample S-131
	Very dark gray (10 YR 3/1). 0% gravel; abrupt, smooth boundary. Composed of decomposing mosses (e.g. <i>Climacium dendroides</i> , <i>Tomentypnum nitens</i> , and very fine roots intermixed with silt.	
A	5-37 cm	Sample S-132
	Very dark gray-brown (10 YR 3/2). Weak, medium, granular structure with 0% gravel. Slightly sticky and plastic consistence (wet). Sandy loam texture. Flooding events indicated by deposits of higher concentrations of organic materials; black (10 YR 2/3). Two distinct bands occur from 22-24 cm and 32-34 cm. Many very fine and fine roots, common medium roots.	
Permafrost	37 cm	

Relevé HV-25 Soil Profile Description

Location:	Shrubby floodplain, base of southern facing toposequence 1 km north of Happy Valley camp		
Description by:	N. Auerbach and A. Gallant		
Sample Date:	7/20/94	Sample Time:	16:15
Classification:			
Parent Material:	Stabilized fine-grained alluvium		
Geomorphic Surface:	Irregular microrelief		
Elevation:	950 ft	Slope:	<5°
Aspect:	S		
Vegetation:	Moist <i>Salix planifolia</i> , <i>Betula nana</i> , <i>Petasites frigidus</i> , <i>Sphagnum squarrosum</i> low shrubland (riparian)		

Horizon:	Description:	
Oe	0-8 cm	Sample S-133
	(10 YR 2/1). 0% gravel; abrupt, smooth boundaries. Comprised of some moss and roots and woody debris from <i>Salix</i> and <i>Betula</i> . Many very fine, fine and medium roots; common coarse roots.	
A	8-21+ cm	Sample S-134
	(10 YR) 3.5/2). Weak, medium granular structure with 0% gravel. Slightly sticky, slightly plastic consistence (wet). Loam texture. Many very fine, fine and medium roots; common coarse roots.	
Permafrost	21 cm	

Relevé HV-26 Soil Profile Description

Location:	Toposequence 1 km north of Happy Valley camp and about 400 m west of Haul road		
Description by:	A. Gallant		
Sample Date:	7/24/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium		
Geomorphic Surface:	Featureless		
Elevation:	1000 ft	Slope:	<5°
		Aspect:	S
Vegetation:	Moist <i>Eriophorum vaginatum</i> , <i>Betula nana</i> , <i>Ledum decumbens</i> , <i>Sphagnum girgensohnii</i> tussock-graminoid, dwarf-shrub tundra		

Horizon:	Description:	
Oi1	0-14 cm	Sample S-135
	Dark yellow-brown (10 YR 4/6). 0% gravel; abrupt, smooth boundary. Top 7 cm consist mostly of live moss (<i>Sphagnum</i>).	
Oi2	14-20 cm	Sample S-136
	Black to very dark brown (10 YR 2/1.5). 0% gravel; abrupt, smooth boundary. Many fine to medium roots. Composed mainly of moss (e.g. <i>Sphagnum</i>) and secondarily of roots.	
Oe	20-28 cm	Sample S-137
	Very dark brown (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Composed primarily of roots and secondarily of mosses. Many fine and medium roots. Coarse roots common.	
Permafrost	26 cm	
Bw	28+ cm	Sample S-138
	Very dark gray-brown to dark brown (10 YR 3/2.5). Massive structure with 0% gravel. Sticky, plastic consistence (wet); clay loam texture. Many very fine roots. About 50% ice.	

Relevé HV-27 Soil Profile Description

Location:	Toposequence 1 km north of Happy Valley camp and about 400 m west of Haul road		
Description by:	A. Gallant		
Sample Date:	7/24/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium		
Geomorphic Surface:	Featureless		
Elevation:	1000 ft	Slope:	5°
Aspect:	S		
Vegetation:	Moist <i>Betula nana</i> , <i>Salix planifolia</i> , <i>Eriophorum vaginatum</i> , <i>Aulacomnium turgidum</i> dwarf-shrub tussock tundra		

Horizon:	Description:
Oi1	0-8 cm | Sample S-139
	Very dark brown (10 YR 2/3). 0% gravel. Top 2 cm consist of loose mat of live moss and <i>Aulacomnium turgidum</i> .
Oi2	8-14 cm | Sample S-140
	Dark yellow-brown (10 YR 2/4). 0% gravel. Composed mainly of fine and very fine roots. Many medium roots.
Oe	14-21 cm | Sample S-141
	Dark brown (10 YR 3/3). 0% gravel. Composed mainly of <i>Sphagnum</i> and <i>Aulacomnium</i> mosses. Many very fine and fine roots.
Oa	21-29 cm | Sample S-142
	Black (10 YR 2/1) 0% gravel. Abrupt, smooth boundary; many very fine and fine roots.
Permafrost	23 cm
Bw	29+ cm | Sample S-143
	Gray (10 YR 5/1). Massive structure with 0% gravel. Clay loam texture. Many medium sized, yellow brown mottles (10 YR 5/8). Lenses of ice 1-2 mm thick occur within this frozen layer.

Relevé HV-28 Soil Profile Description

Location:	Sideslope of toposequence; 1 km north of Happy Valley camp and about 400 m west of Haul road		
Description by:	A. Gallant		
Sample Date:	7/24/94	Sample Time:	
Classification:			
Parent Material:			
Geomorphic Surface:	Featureless		
Elevation:	1050 ft	Slope:	<5°
		Aspect:	S
Vegetation:	Moist <i>Eriophorum vaginatum</i> , <i>Betula nana</i> , <i>Salix planifolia</i> , <i>Hylocomium splendens</i> , <i>Aulacomnium turgidum</i> dwarf-shrub tussock tundra		

Horizon:	Description:	
Oi	0-13 cm	Sample S-144
	Dark yellow-brown (10 YR 3/4). 0% gravel; abrupt, smooth boundary. Top 7 cm comprised of live moss layer (e.g., <i>Aulacomnium turgidum</i>). Color and bulk density sample are from 7-13 cm depth; mainly composed of roots, many fine and very fine roots.	
Oe	13-19 cm	Sample S-145
	Black (10 YR 2/1). 0% gravel; abrupt, smooth boundary. Mostly composed of roots and sedge parts. Many very fine, fine roots and common coarse roots.	
Oa	19-25 cm	Sample S-146
	Black (10 YR 2/1). 0% gravel; abrupt, smooth boundary. Many very fine and fine roots.	
Bw	25+ cm	Sample S-147
	Dark gray-brown (10 YR 4/2). 0% gravel. Sticky, plastic consistence (wet). Silty clay loam texture. Layer includes strong brown, medium size mottles (7.5 YR 4/6). Common very fine roots.	
Permafrost	25 cm	

Relevé HV-29 Soil Profile Description

Location:	Hillside toposequence; 1 km north of Happy Valley camp and about 400 m west of Haul road		
Description by:	A. Gallant		
Sample Date:	7/24/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium		
Geomorphic Surface:	Featureless		
Elevation:	1050 ft	Slope:	<5°
Aspect:	S		
Vegetation:	Moist <i>Eriophorum vaginatum</i> ; <i>Salix planifolia</i> , <i>Aulacomnium turgidum</i> tussock-graminoid, dwarf-shrub tundra		

Horizon:	Description:
Oi	0-10 cm Sample S-148 Brown-yellow (10 YR 6/6). 0% gravel; abrupt, smooth boundary. Composed mainly of <i>Sphagnum</i> .
Oe	10-16 cm Sample S-149 Black (10 YR 2/1). 0% gravel; clear, smooth boundary. Composed mainly of roots, moss and deciduous leaves. Many very fine roots, medium roots common.
Oa	16-19 cm Sample S-150 Very dark brown (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Many very fine roots and medium roots, fine roots are common.
Bw	19-26+ cm Sample S-151 Gray (10 YR 5/1). Massive structure with 0% gravel. Very sticky, very plastic consistence (wet); Silty clay texture. Many large dark yellow-brown mottles (10 YR 3/4). Many very fine roots and fine roots are common
Permafrost	26 cm

Relevé HV-30 Soil Profile Description

Location:	North hillslope crest of toposequence; 1 km north of Happy Valley camp and about 400 m west of Haul road		
Description by:	A. Gallant		
Sample Date:	7/24/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium and till		
Geomorphic Surface:	Featureless		
Elevation:	1000 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Moist <i>Carex Bigelowii</i> , <i>Eriophorum vaginatum</i> , <i>Betula nana</i> , <i>Dodecatheon frigidum</i> , <i>Hylocomium splendens</i> , <i>Arctagrostis latifolia</i> tussock, graminoid, dwarf-shrub tundra		

Horizon:	Description:	
Oi1	0-10 cm	Sample S-152
	Black to very dark brown (10 YR 2/1.5). Abrupt, smooth boundary. Top 6 cm composed of moss (<i>Aulacomnium turgidum</i>), lichens and roots.	
Oi2	10-18 cm	Sample S-153
	Strong brown (7.5 YR 4/6). Abrupt, smooth boundary. Many very fine roots, fine roots common. Mainly composed of <i>Sphagnum</i> moss.	
Oa	18-21 cm	Sample S-154
	Black (10 YR 2/1). Abrupt, smooth boundary. Many very fine and medium roots. Fine roots common.	
Bw	21+ cm	Sample S-155
	Gray (10 YR 5/1). Massive structure with less than 10% gravel. Sticky, plastic consistence (wet). Silty clay loam texture	
Permafrost	21 cm	

Relevé HV-31 Soil Profile Description

Location:	Hillslope about 300 m west of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/26/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium		
Geomorphic Surface:			
Elevation:	1000 ft	Slope:	4°
Aspect:	E		
Vegetation:	Moist <i>Carex Bigelowii</i> , <i>Tomentypnum nitens</i> , <i>Dryas integrifolia</i> , <i>Salix glauca</i> , <i>Cetraria cucullata</i> sedge, dwarf-shrub tundra		

Horizon:	Description:
Oi	0-10 cm | Sample S-156
	Strong brown (7.5 YR 4/6). 0% gravel; abrupt, smooth boundary. Composed mainly of mosses (<i>Aulacomnium turgidum</i>) but also leaves and roots. Top 1 cm is moss.
Oa	10-19 cm | Sample S-157
	Black (10 YR 2/1). 0% gravel; abrupt, smooth boundary. Many very fine roots and coarse roots are common.
Bw	19-36+ cm | Sample S-158
	Dark gray-brown (10 YR 4.5/2). For some patches gray (10 YR 5/1) is the original color of the layer before decomposition of organics and gravel (gravel oxidation responsible for mottles). Enough decomposition has occurred that predominant horizon color is (10 YR 4.5/2) as already listed. Less than 10% gravel; sticky plastic consistence (wet). Silty clay loam texture. Many very fine roots, cobbles up to 3 cm in diameter. Large, strong brown (7.5 YR 4/6) mottles are common. They are diffuse due to a mixing with surrounding material.
Permafrost	36 cm

Relevé HV-32 Soil Profile Description

Location:	Top of hill 500 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/26/94	Sample Time:	
Classification:			
Parent Material:	Colluvium		
Geomorphic Surface:	Featureless		
Elevation:	1050 ft	Slope:	1°-2°
		Aspect:	W
Vegetation:	Moist <i>Eriophorum vaginatum</i> , <i>Betula nana</i> , <i>Ledum decumbens</i> , <i>Sphagnum angustifolium</i> tussock-graminoid dwarf-shrub tundra		

Horizon:	Description:	
Oi	0-11 cm	Sample S-159
	Dark yellow-brown (10 YR 4/5). 0% gravel; abrupt, smooth boundary. Composed mainly of <i>Sphagnum</i> . Top 6 cm is composed of live material; layer is a loose mat.	
Oe	11-25 cm	Sample S-160
	Black (10 YR 2/1). 0% gravel; abrupt, smooth boundary. Composed of roots and sedge parts, many very fine and fine roots. medium roots are common.	
Permafrost	23 cm	
Bw	25+ cm	Sample S-161
	Gray-brown to dark gray-brown (10 YR 4.5/2 and 2.5 YR 4.5/2). Can't determine structure due to frozen nature of soil and when thawed it is too wet. Between 10 and 25% gravel; sticky, plastic consistence (wet). Silty clay loam texture. Cobbles up to 20 cm in diameter, very fine roots. Dark yellow-brown mottles (10 YR 3/6).	

Relevé HV-33 Soil Profile Description

Location:	Water track transect about 500 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/26/94	Sample Time:	
Classification:			
Parent Material:			
Geomorphic Surface:	Palso		
Elevation:	1050 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Moist <i>Betula nana</i> , <i>Rubus chamaemorus</i> , <i>Ledum decumbens</i> , dwarf-shrub, moss tundra.		

Horizon:	Description:
Oi	0-9 cm | Sample S-162 Dark yellow-brown (10 YR 3/4). 0% gravel; abrupt, smooth boundary. Composed mainly of mosses (<i>Sphagnum</i>). Loose mat; top 4 cm are live material.
Oe1	9-14 cm | Sample S-163 Dark brown (7.5 YR 4/4). 0% gravel; abrupt, smooth boundary. Many fine and very fine roots; common medium roots. Composed mainly of <i>Sphagnum</i> mosses, roots. More compression than Oi layer.
Oe2	14-23 cm | Sample S-164 Very dark brown to black (10 YR 2/1.5). 0% gravel. Composed mainly of sedge parts. Also roots and mosses. More compression than Oe1 layer; can peel this layer apart in sheets. Many very fine roots.
Permafrost	23 cm
Bw	23+ cm | Sample S-165 (10 YR 3/2). Weak, fine, subangular blocky structure with 0% gravel. Sticky, plastic consistence (wet). Silty clay loam texture. Many very fine roots. No mottles.

Relevé HV-34 Soil Profile Description

Location:	Water track transect about 500 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/26/94	Sample Time:	
Classification:			
Parent Material:	Fine-grained alluvium		
Geomorphic Surface:	well-developed water track		
Elevation:	1025 ft	Slope:	<5° (about 1°)
		Aspect:	NE
Vegetation:	Wet <i>Eriophorum angustifolium</i> , <i>Betula nana</i> , <i>Sphagnum squarrosum</i> graminoid, dwarf-shrub tundra		

Horizon:	Description:	
Oi	0-7 cm	Sample S-166
	Dark yellow-brown (10 YR 3/6). 0% gravel; abrupt, smooth boundary. Composed of <i>Sphagnum</i> moss.	
Oa1	7-14 cm	Sample S-167
	Dark brown (10 YR 3/3). 0% gravel; abrupt, smooth boundary. Many very fine and fine roots. Medium roots common. This layer is very silty, as if a flood event deposited silt all at once.	
Oa2	14-33 cm	Sample S-168
	Very dark brown (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Many fine and very fine roots. Medium roots common.	
Bw	33-51+ cm	Sample S-169
	Dark brown (10 YR 3/3). Weak, very fine, granular structure with 0% gravel. Sticky, plastic consistence (wet). Silty clay loam texture. Many very fine roots and common fine roots.	
Permafrost	51 cm	

Relevé HV-35 Soil Profile Description

Location:	Water track transect about 500 m south west of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/27/94	Sample Time:	
Classification:			
Parent Material:	Fine grained alluvium and organic material		
Geomorphic Surface:	High feature in a water track (Palsa?)		
Elevation:	1000 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Moist <i>Betula nana</i> , <i>Ledum decumbens</i> , <i>Rubus chamaemorus</i> , <i>Aulacomnium turgidum</i> dwarf-shrub tundra		

Horizon:	Description:	
Oi	0-5 cm	Sample S-170
	Brown to yellow-brown (10 YR 5/3.5). 0% gravel; abrupt, smooth boundary. Top 2 cm are live material. Composed mainly of mosses.	
Oe1	5-12 cm	Sample S-171
	Dark brown (7.5 YR 3/4). 0% gravel; abrupt, smooth boundary. Many very fine and fine roots; medium roots are common. Composed of roots and woody stem parts.	
Oe2	12-18 cm	Sample S-172
	Very dark brown (7.5 YR 2/4). 0% gravel; abrupt, smooth boundary. Many very fine roots, medium and fine roots are common. Composed of roots and woody stem materials. More silt in this layer than in Oe1.	
Oa	18-25 cm	Sample S-173
	Very dark brown (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Almost enough mineral component to be an A horizon, but organics still dominate. Many very fine roots and fine roots are common.	
Bw	25-28+ cm	Sample S-174
	Dark gray-brown (10 YR 4/2). Weak, very fine, subangular blocky structure with 0% gravel. Sticky, plastic consistence (wet). Silty clay loam texture. Many very fine roots, no mottles.	
Permafrost	25 cm	

Relevé HV-36 Soil Profile Description

Location:	Water track transect about 500 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/27/94	Sample Time:	
Classification:			
Parent Material:	Fine-grained alluvium and organic material from colluvial basin		
Geomorphic Surface:	Raised area (island) in water track		
Elevation:	1000 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Moist <i>Salix planifolia</i> , <i>Sphagnum angustifolium</i> , <i>Sphagnum warnstorffii</i> low shrubland		

Horizon:	Description:	
Oi1	0-10 cm	Sample S-175
	Yellow-brown to dark yellow brown (10 YR 4.5/4). 0% gravel; abrupt, smooth boundary. Top 5 cm are live mosses (<i>Sphagnum</i>). Many very fine roots, medium and fine roots are common. Slightly compressed mat of <i>Sphagnum</i> and some roots.	
Oe1	10-15 cm	Sample S-176
	Very dark brown (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Mainly composed of roots. Also has <i>Sphagnum</i> and sedge parts. Many very fine and fine roots. Medium roots common.	
Oi2	15-17 cm	Sample S-177
	Dark yellow brown (10 YR 3/6). 0% gravel; abrupt, smooth boundary. <i>Sphagnum</i> moss with many very fine and fine roots.	
Oe2	17-22 cm	Sample S-178
	Dark brown (10 YR 3/3). 0% gravel; abrupt, smooth boundary. Composed of roots and sedge parts. Many very fine roots, fine roots are common.	
A2	22-28+ cm	Sample S-179
	Very dark gray-brown (10 YR 3/2). Weak, very fine granular and subangular blocky structures present; 0% gravel. Sticky, plastic consistence (wet). Silty loam texture; many very fine roots, fine roots common.	
Permafrost	22 cm	

Relevé HV-37 Soil Profile Description

Location:	Water track transect about 500 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/27/94	Sample Time:	
Classification:			
Parent Material:	Fine grained alluvium and organic material		
Geomorphic Surface:	Water track		
Elevation:	1050 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Wet <i>Carex aquatilis</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum squarrosum</i> , <i>Sphagnum angustifolium</i> , <i>Salix planifolia</i> , <i>Betula nana</i> graminoid, low-shrub tundra.		

Horizon:	Description:
Oi	0-7 cm Sample S-180
	Dark yellow-brown (10 YR 4/5). 0% gravel; abrupt, smooth boundary. Mainly <i>Sphagnum</i> moss. Top 4 cm are live material. Many very fine roots; fine and medium roots are common.
Oe	7-16 cm Sample S-181
	Dark brown (7.5 YR 3/3). 0% gravel; abrupt, smooth boundary. Mainly roots plus mosses, sedges and woody stems. Many very fine and fine roots; medium roots common.
Oa	16-28 cm Sample S-182
	Very dark brown (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Many very fine roots. Fine roots common.
Bw	28-55+ cm Sample S-183
	Dark brown (10 YR 3/3). Weak, very fine granular and subangular blocky structures exhibited. 0% gravel. Sticky, plastic consistence (wet). Silty clay loam texture. Very fine roots common; no mottles.
Permafrost	55 cm

Relevé HV-38 Soil Profile Description

Location:	Water track transect about 500 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/27/94	Sample Time:	
Classification:			
Parent Material:			
Geomorphic Surface:	"Island" (raised area in water track)		
Elevation:	1050 ft	Slope:	0°
		Aspect:	Flat
Vegetation:	Moist <i>Ledum palustre</i> ssp. <i>decumbens</i> , <i>Betula nana</i> , <i>Rubus chamaemorus</i> , <i>Aulacomnium turgidum</i> , <i>Sphagnum angustifolium</i> dwarf-shrub tundra		

Horizon:	Description:
Oi1	0-7 cm | Sample S-184 Dark yellow-brown (10 YR 4/4). 0% gravel; abrupt, smooth boundary. Top 2 cm are live material. Many very fine roots. Coarse roots are common, medium roots are very common. Composed of <i>Sphagnum</i> moss.
Oi2	7-13 cm | Sample S-185 Dark brown (10 YR 3/3). 0% gravel; abrupt, smooth boundary. Composed mainly of <i>Sphagnum</i> , but also of roots. Many very fine and fine roots. Coarse roots common as well as medium roots.
Oe	13-18 cm | Sample S-186 Very dark brown (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Composed of roots and sedge parts. Many very fine and fine roots.
Oa	18-24 cm | Sample S-187 Black (10 YR 2/1). 0% gravel; abrupt, smooth boundary. Many very fine and fine roots.
Permafrost	23 cm
Bw	24+ cm | Sample S-188 Very dark gray-brown (10 YR 3/2). Massive structure with 0% gravel. Sticky, very plastic consistence (wet). Clay loam texture. Few fine, brown to dark brown mottles (7.5 YR 4/4). Lots of sedge parts decomposing in this layer.

Relevé HV-39 Soil Profile Description

Location:	Water track transect about 500 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/27/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium		
Geomorphic Surface:	Featureless		
Elevation:	1050 ft	Slope:	1°-2°
Aspect:	E		
Vegetation:	Moist <i>Eriophorum vaginatum</i> , <i>Betula nana</i> , , tussock-graminoid, dwarf-shrub tundra		

Horizon:	Description:
Oi	0-11 cm Sample S-189
	Dark yellow-brown (10 YR 3.5/6). 0% gravel; abrupt, smooth boundary. top 2 cm are live material. Composed mainly of a loose mat of Sphagnum. Very fine roots common.
Oe	11-26 cm Sample S-190
	Very dark brown (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Mainly composed of sedge parts. Also roots and leaves. Many very fine roots, fine roots are common.
Permafrost	25 cm
Bw	26+ cm Sample S-191
	Dark gray (10 YR 4/1). 0% gravel; sticky, very plastic consistence (wet). Clay loam texture. Many large, strong brown mottles (7.5 YR 4/6).

Relevé HV-40 Soil Profile Description

Location:	Water track transect about 600 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/27/94	Sample Time:	
Classification:			
Parent Material:	Fine grained alluvium		
Geomorphic Surface:	Island (raised area) in water track		
Elevation:	1025	Slope:	<5° (1°-2°) Aspect: NE
Vegetation:	<i>Betula nana</i> , <i>Ledum palustre</i> ssp. <i>decumbens</i>		

Horizon:	Description:	
Oi	0-5 cm	Sample S-192
	Dark brown (7.5 YR 3/4). Top 1 cm is live material. Composed of moss and roots. Many very fine roots while medium and fine roots are common.	
Oe	5-9 cm	Sample S-193
	Very dark brown (10 YR 2/2). Composed of roots. Many very fine roots, fine roots are common while medium roots are many.	
Oa	9-12 cm	Sample S-194
	Dark brown (7.5 YR 3/4). Many very fine roots; fine roots are common.	
Oe2	12-20 cm	Sample S-195
	Very dark brown (10 YR 2/2). Composed of roots and sedge parts. Many very fine roots, fine roots are common.	
A2	20-33+ cm	Sample S-196
	Very dark gray-brown (10 YR 3/2). Massive but relatively loose (as opposed to dense) structure. Loam texture. Many large organic pieces throughout matrix of layer. Many very fine roots	
Permafrost	33 cm	
	Slightly sticky, plastic consistence (wet).	

Relevé HV-41 Soil Profile Description

Location:	Hillslope about 400 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/26/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium		
Geomorphic Surface:	Frost scars		
Elevation:	1000 ft	Slope:	<5°
		Aspect:	E
Vegetation:	Dry <i>Luzula arctica</i> , <i>Anthelia juratzkana</i> barren		

Horizon:	Description:	
O	0-1 cm	No sample
	Layer too thin to sample.	
Bw	1-48+ cm	Sample S-197
	Gray to gray-brown (10 YR 5/1.5). Weak, very fine granular structure with less than 10% gravel. Sticky, plastic consistence (wet). Silty clay loam texture. Many medium, dark yellow-brown mottles (10 YR 4/6). Many very fine roots, fine roots are common. Cobbles to 2 cm in diameter. Structure of layer is moderate at the top few cm of the layer but weak throughout most of the layer.	
Permafrost	48 cm	

Relevé HV-42 Soil Profile Description

Location:	Hillslope about 300 m southwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/26/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium (and glacial outwash?)		
Geomorphic Surface:	Featureless		
Elevation:	1000 ft	Slope:	3°
		Aspect:	E
Vegetation:	Moist <i>Eriophorum vaginatum</i> , <i>Salix glauca</i> , <i>Cassiope tetragona</i> , <i>Aulacomnium turgidum</i> , <i>Dicranum</i> sp., <i>Sphagnum warnstorffii</i> tussock-graminoid, dwarf-shrub tundra		

Horizon:	Description:
Oi	0-3 cm | Sample S-198
	Dark yellow-brown (10 YR 4/4). 0% gravel; abrupt, smooth boundary. Composed mainly of moss (e.g. <i>Aulacomnium turgidum</i>) and liverworts (e.g. <i>Ptilidium ciliare</i>).
Oe	3-7 cm | Sample S-199
	Black (10 YR 2/1). 0% gravel; abrupt, smooth boundary. Many very fine and fine roots. Composed mainly of roots and mosses.
Bw	7-60+ cm | Sample S-201
	Dark gray-brown (2.5 YR 4/2). Moderate, fine, granular structure with 10% gravel. Sticky, plastic consistence (wet). Silty clay loam texture. Many large mottles (5 YR 5/8). Sapric inclusion (10 YR 2/1.8) at about 15 cm depth (discontinuous, not a layer). Many very fine roots; fine and medium roots are common.
Permafrost	60 cm
NOTE:	Several soil pits around this site indicate much variability in soil stratigraphy. Variability includes: (1) an organic layer O ranging from 7 to 18 cm in thickness, (2) an Oa layer ranging from absent to 10 cm in thickness to discontinuous inclusions in the Bw layer (Sample S-200), and (3) a thaw depth ranging from 35 cm to 6 cm.

Relevé HV-43 Soil Profile Description

Location:	Small island with tall salix along creek about .5 km south of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/25/94	Sample Time:	17:00
Classification:			
Parent Material:	Stabilized alluvium		
Geomorphic Surface:	Featureless		
Elevation:	950 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Moist <i>Salix alaxensis</i> , <i>Aconitum delphinifolium</i> tall shrubland		

Horizon:	Description:
Oe	0-5 cm | Sample S-202
	Very dark brown (10 YR 2/3). 0% gravel; abrupt, broken boundary. Many fine and very fine roots. Comprised of decomposed leaves and grasses.
Oa	5-9 cm | Sample S-203
	Black (10 YR 2/1). 0% gravel; abrupt, broken boundary. Many fine and very fine roots. Appears to be just a pocket of Oa material - likely derived from rodent tunneling activity.
A	5-20 cm | Sample S-204
	Dark brown (10 YR 3/3). Weak, very fine, subangular blocky structure with 0% gravel. Slightly sticky, slightly plastic consistence (wet). Sandy loam texture. Many fine and very fine roots, medium roots common.
Rock Layer	20 cm
	100% large rocks bigger than 15 cm.

Relevé HV-44 Soil Profile Description

Location:	Northwest-facing footslope; nonacidic tundra		
Description by:	A. Gallant		
Sample Date:	7/25/94	Sample Time:	
Classification:			
Parent Material:	Colluvium and alluvium		
Geomorphic Surface:	Turf hummocks		
Elevation:	950 ft	Slope:	5°
		Aspect:	NW
Vegetation:	Moist <i>Dryas integrifolia</i> , <i>Lupinus arcticus</i> , <i>Equisetum arvense</i> , <i>Tomentypnum nitens</i> forb, dwarf- shrub, moss tundra		

Horizon:	Description:	
Ol	0-7 cm	No sample
	Yellow-brown (10 YR 5/6). 0% gravel; abrupt, broken boundary. Top 2 cm are live moss. Composed mainly of <i>Tomentypnum nitens</i> and <i>Hylocomium splendens</i> .	
Oi2	7-14 cm	Sample S-205
	Dark yellow-brown (10 YR 4/6). 0% gravel; abrupt, wavy boundary. Composed mainly of mosses. Discontinuous layer. Many medium and very fine roots.	
Oe	7-14 cm	Sample S-206
	Black (10 YR 2/1). 0% gravel; abrupt, wavy boundary. Composed mainly of sedge parts and mosses. Discontinuous layer. Many very fine, fine and medium roots.	
Oa	14-21 cm	Sample S-207
	Black (10 YR 2/1). 0% gravel. Many very fine, fine and medium roots.	
Bw	21-62 cm	Sample S-208
	Very dark gray-brown (2.5 YR 3/2). Weak, very fine, subangular blocky structure with 75% gravel. Very sticky, very plastic consistence (wet). Silt clay texture. Includes cobbles up to 48 cm in diameter. Many very fine roots. Common small to large mottles (.5 YR 5/6).	
Permafrost	62 cm	

Relevé HV-45 Soil Profile Description

Location:	West-facing footslope, nonacidic tundra; 15 m North of gridpoint 7671600N 426900E		
Description by:	A. Gallant		
Sample Date:	7/25/94	Sample Time:	
Classification:			
Parent Material:	Colluvium and alluvium		
Geomorphic Surface:	Turf hummocks		
Elevation:	950 ft	Slope:	5°
Aspect:	W		
Vegetation:	Moist <i>Dryas integrifolia</i> , <i>Lupinus arcticus</i> , <i>Equisetum arvense</i> , <i>Tomentypnum nitens</i> forb, dwarf- shrub, moss tundra		

Horizon:	Description:	
Oi	0-6 cm	Sample S-209
	Black (10 YR 2/1). 0% gravel; abrupt, wavy boundary. Top 2 cm are live mosses (<i>Tomentypnum nitens</i> , <i>Hylocomium splendens</i> , <i>Aulacomnium turgidum</i>). Many very fine and fine roots.	
Oa	6-10 cm	Sample S-210
	Black (10 YR 2/1). 0% gravel; abrupt, broken boundary. Many very fine and fine roots.	
Bw	10-59 cm	Sample S-211
	Dark to very dark gray-brown (2.5 YR 3.5/2). Massive structure with less than 10% gravel. Very sticky, very plastic consistence (wet). Clay texture. Few large, yellow-brown mottles (10 YR 5/6). Less than 5% of total soil volume is cobbles (up to 9 cm in diameter).	
Permafrost	59 cm	

Relevé HV-46 Soil Profile Description

Location:	Southern margin of small lake about 1 km west of Haul road and 1.5 km northwest of Happy Valley camp		
Description by:	S. Walker		
Sample Date:	7/22/94	Sample Time:	
Classification:			
Parent Material:	Lake or pond organic sand or silt		
Geomorphic Surface:	Lake		
Elevation:	1040 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Aquatic <i>Menyanthes trifoliata</i> forb marsh		

Horizon:	Description:	
Oi	0-42 cm	Sample S-212
	Very dark brown (10 YR 2/2). 0% gravel. Fibric mat of fine and very fine roots. Perg. Cryofibril.	
Permafrost	42 cm	

Relevé HV-47 Soil Profile Description

Location:	Southern margin of lake; 1 km west of Haul road and 1.5 km northwest of Happy Valley camp		
Description by:	S. Walker and A. Gallant		
Sample Date:	7/22/94	Sample Time:	
Classification:			
Parent Material:	Lacustrine organic deposits		
Geomorphic Surface:	Featureless		
Elevation:	1040 ft	Slope:	0°
		Aspect:	Flat
Vegetation:	Wet <i>Carex rotundata</i> , <i>Carex chordorrhiza</i> , <i>Pedicularis sudetica</i> , <i>Sphagnum orientale</i> , <i>Drepanocladus revolvens</i> graminoid tundra		

Horizon:	Description:	
Oil	0-4 cm	Sample S-213
	Very dark brown to black (10 YR 2/1.5). 0% gravel; many fine and very fine roots. Composed of graminoid material and mosses (<i>Drepanocladus revolvens</i> , sphdri).	
Oi2	4-17 cm	Sample S-214
	Very dark brown (10 YR 2/2) 0% gravel. Many fine and very fine roots.	
Oe	17-40 cm	Sample S-215
	Very dark brown (10 YR 2/2) 0% gravel. Many very fine roots.	
Permafrost	40 cm	

Relevé HV-48 Soil Profile Description

Location:	Southern margin of lake; 1 km west of Haul road and 1.5 km northwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/22/94	Sample Time:	
Classification:			
Parent Material:	Lake or pond organic silt		
Geomorphic Surface:	Lake		
Elevation:	1040 ft	Slope:	0°
		Aspect:	Flat
Vegetation:	Aquatic <i>Arctoa fulvella</i> , <i>Menyanthes trifoliata</i> graminoid marsh		

Horizon:	Description:	
Oi	0-? cm	Sample S-216
	Very dark brown (10 YR 2/2). 0% gravel.	

Relevé HV-49 Soil Profile Description

Location:	Raised hummock area 1 km west of Haul road and 1.5 km northwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/22/94	Sample Time:	
Classification:			
Parent Material:	Basin colluvium and organic deposits		
Geomorphic Surface:	Wetland hummock		
Elevation:	1040 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Wet <i>Carex rotundata</i> , <i>Carex aquatilis</i> , <i>Andromeda polifolia</i> , <i>Rubus chamaemorus</i> , <i>Sphagnum imbricatum</i> graminoid, dwarf- shrub, moss tundra		

Horizon:	Description:	
Oi	0-21 cm	Sample S-217
	Dark yellow-brown (10 YR 3.5/4). 0% gravel. Composed of <i>Sphagnum</i> moss. Many very fine roots; medium roots are common. Top 10 cm are live plant mosses.	
Oe	21-? cm	Sample S-218
	Black (10 YR 2/1). 0% gravel.	
Permafrost	21 cm	

Relevé HV-50 Soil Profile Description

Location:	Southern margin of lake; 1 km west of Haul road and 1.5 km northwest of Happy Valley camp. Raised hummock area.		
Description by:	A. Gallant and N. Auerbach		
Sample Date:	7/22/94	Sample Time:	13:20
Classification:			
Parent Material:	Basin colluvium and organic deposits		
Geomorphic Surface:	Wetland hummock		
Elevation:	1050 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Wet <i>Sphagnum imbricatum</i> , <i>Carex aquatilis</i> , <i>Betula nana</i> , <i>Andromeda polifolia</i> moss graminoid, dwarf- shrub tundra		

Horizon:	Description:	
Oi1	0-20 cm	Sample S-219
	First 10 cm of depth consists primarily of loose mat of . Next 10 cm are dark red-brown (5 YR 3/5); 0% gravel. Consists mostly of decomposing <i>Sphagnum</i> . Many fine, very fine and medium roots.	
Oi2	20-31+ cm	Sample S-220
	Very dark gray-brown (10 YR 3/2). 0% gravel; consists of <i>Sphagnum</i> and more roots than Oi1	

Relevé HV-51 Soil Profile Description

Location:	Southern margin of lake; 1 km west of Haul road and 1.5 km northwest of Happy Valley camp		
Description by:	S. Walker, A. Gallant, N. Auerbach		
Sample Date:	7/22/94	Sample Time:	14:10
Classification:			
Parent Material:	Basin colluvium and organic deposits		
Geomorphic Surface:	Featureless		
Elevation:	1050 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Wet <i>Carex chordorrhiza</i> , <i>Carex rotundata</i> , <i>Sphagnum orientale</i> graminoid tundra		

Horizon:	Description:
Oi1	0-3 cm No sample
	Black (10 YR 2/2). 0% gravel; Loose mat of mosses and dead sedge leaves, mostly <i>Sphagnum orientale</i> .
Oi2	3-44 cm Sample S-221
	Dark brown (7.5 YR 3/2). 0% gravel. Fibric organic consisting of sedge roots and leaves.

Relevé HV-52 Soil Profile Description

Location:			
Description by:	A. Gallant		
Sample Date:	7/22/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium		
Geomorphic Surface:	Well-developed water tracks		
Elevation:	1040 ft	Slope:	<5°
Aspect:	NE		
Vegetation:	Wet <i>Carex rotundata</i> , <i>Betula nana</i> , <i>Salix fuscescens</i> , light green <i>Sphagnum</i> graminoid, dwarf- shrub, moss tundra		

Horizon:	Description:	
Oi	0-7 cm	No sample
	0% gravel; abrupt, smooth boundary. Composed of <i>Sphagnum</i> moss	
Oe1	7-14 cm	Sample S-222
	Very dark brown (7.5 YR 3/3). 0% gravel; abrupt, smooth boundary. Composed mainly of <i>Sphagnum</i> ; many very fine roots.	
Oe2	14-22 cm	Sample S-223
	Very dark brown (10 YR 3/4). 0% gravel; abrupt, smooth boundary. Composed of roots and <i>Sphagnum</i> .	
Oa	22-27 cm	Sample S-224
	Black (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Many very fine roots.	
C	27-47+ cm	Sample S-225
	Grayish-brown (2.5 YR 5/2). Massive structure with 0% gravel. Very sticky, very plastic consistence (wet). Clay texture. Common large mottles with 2 colors very dark gray (10 YR 3/1) and very dark grayish brown (10 YR 3/2).	
Permafrost	47 cm	

Relevé HV-53 Soil Profile Description

Location:	Hillslope water track about .5 km west of small lake and 1 km west of Haul road and 1.5 km west of Happy valley camp		
Description by:	A. Gallant		
Sample Date:	7/22/94	Sample Time:	
Classification:			
Parent Material:	Hillslope colluvium		
Geomorphic Surface:	Well developed hillslope		
Elevation:	1050 ft	Slope:	<5°
Aspect:	NE		
Vegetation:	Wet <i>Carex aquatilis</i> , <i>Betula nana</i> , <i>Salix fuscescens</i> , <i>Sphagnum angustifolium</i> graminoid, dwarf- shrub, moss tundra		

Horizon:	Description:
Oi	0-11 cm | Sample S-226
	Strong brown (7.5 YR 4/6). 0% gravel; abrupt, smooth boundary. Composed mainly of <i>Sphagnum</i> moss. Weak, platy structure due to compression of organic materials.
Oe	11-21 cm | Sample S-227
	Very dark brown (7.5 YR 2/4). 0% gravel; abrupt, smooth boundary. Weak, platy structure due to compression. Many very fine roots.
Oa	21-27 cm | Sample S-228
	Very dark gray-brown (10 YR 3/2). 0% gravel; abrupt, smooth boundary. Many very fine roots.
C	27-42+ cm | Sample S-229
	Gray-brown (2.5 YR 5/2). Massive structure with 0% gravel. Very sticky, very plastic consistence (wet); clay texture.
Permafrost	42 cm

Relevé HV-54 Soil Profile Description

Location:	.25 km west of small lake, 1 km west of Haul road, 1.5 km northwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/22/94	Sample Time:	
Classification:			
Parent Material:	Basin colluvium and organic deposits		
Geomorphic Surface:	Featureless		
Elevation:	1050 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Wet <i>Carex rotundata</i> , <i>Carex chordorrhiza</i> , <i>Sphagnum orientale</i> graminoid tundra		

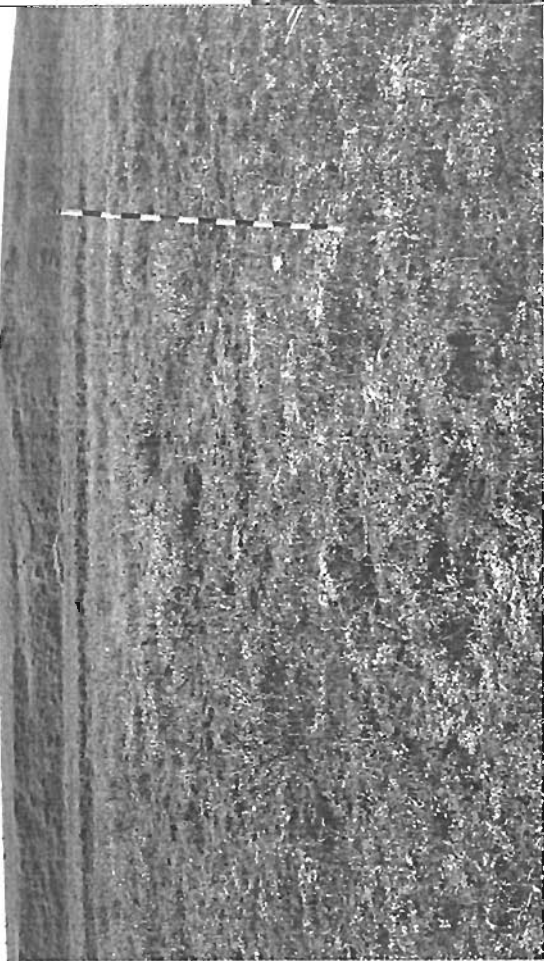
Horizon:	Description:
Oi1	0-3 cm Sample S-230
	Black (10 YR 2/1). 0% gravel; abrupt, smooth boundary. Composed mainly of <i>Sphagnum</i> moss in a loose mat. Approximately 60% recognizable fiber after rubbing.
Oi2	3-15 cm Sample S-231
	Dark brown (10 YR 3/3). 0% gravel; abrupt, smooth boundary. Composed mainly of sedge roots and leaves in a compressed mat. Many fine and very fine roots. Approximately 20% recognizable fiber after rubbing.
Oe	15-24 cm Sample S-232
	Very dark brown (10 YR 2/2). 0% gravel; abrupt, smooth boundary. Many very fine roots. Compressed mat of sedge roots and leaves.
Oa/A	24-32+ cm Sample S-233
	Very dark brown (10 YR 2/2). 0% gravel. About 10% recognizable fiber after rubbing.
Permafrost	32 cm

Relevé HV-55 Soil Profile Description

Location:	Raised hummock area .25 km west of small lake, 1 km west of Haul road, 1.5 km northwest of Happy Valley camp		
Description by:	A. Gallant		
Sample Date:	7/22/94	Sample Time:	
Classification:			
Parent Material:	Basin colluvium and organic deposits		
Geomorphic Surface:	Wetland hummocks		
Elevation:	1050 ft	Slope:	0°
Aspect:	Flat		
Vegetation:	Wet <i>Sphagnum imbricatum</i> , <i>Carex aquatilis</i> , <i>Betula nana</i> , <i>Andromeda polifolia</i> graminoid, dwarf-shrub, moss tundra		

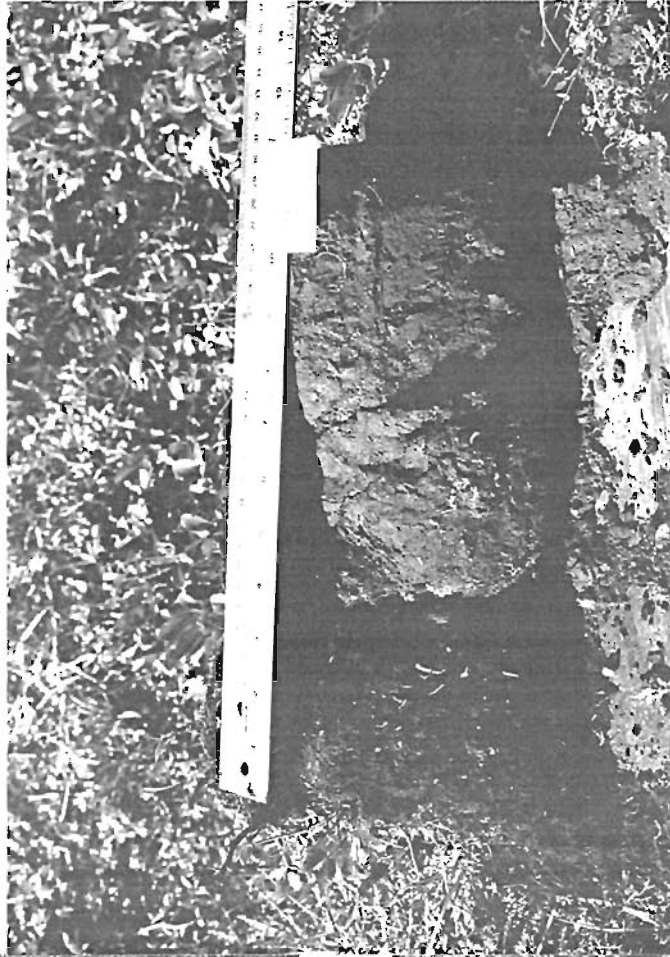
Horizon:	Description:
Oi1	0-9 cm Sample S-234
	Dark brown (7.5 YR 3/4). 0% gravel; abrupt, smooth boundary. composed mainly of <i>Sphagnum</i> moss in a loose mat. Many very fine and fine roots; medium and coarse roots are common.
Oi2	9-16 cm Sample S-235
	Very dark brown (7.5 YR 2/4). 0% gravel; abrupt, smooth boundary. Composed mainly of <i>Sphagnum</i> moss. Somewhat compressed. Many fine and very fine roots, coarse roots common.
Oi3	16-30+ cm Sample S-236
	Dark yellow-brown (10 YR 3.5/6). 0% gravel. Composed mainly of <i>Sphagnum</i> moss and sedge. Many very fine and fine roots. Coarse roots common.
Permafrost	30 cm

Appendix B. Photographs of permanent relevé vegetation and soil profiles.

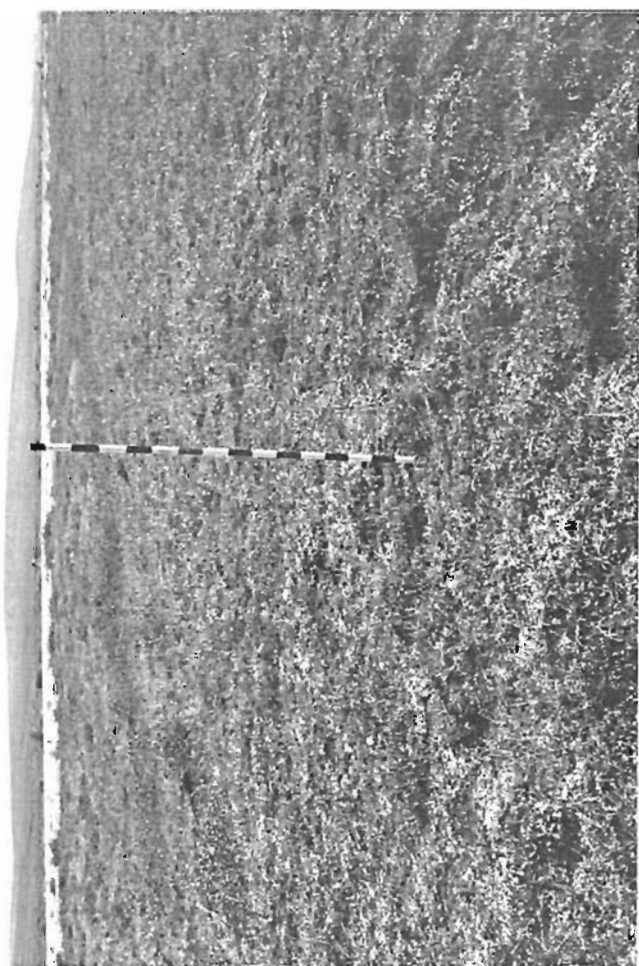


Landscape, Relevé HV-1

Close-up Vegetation, Relevé HV-1

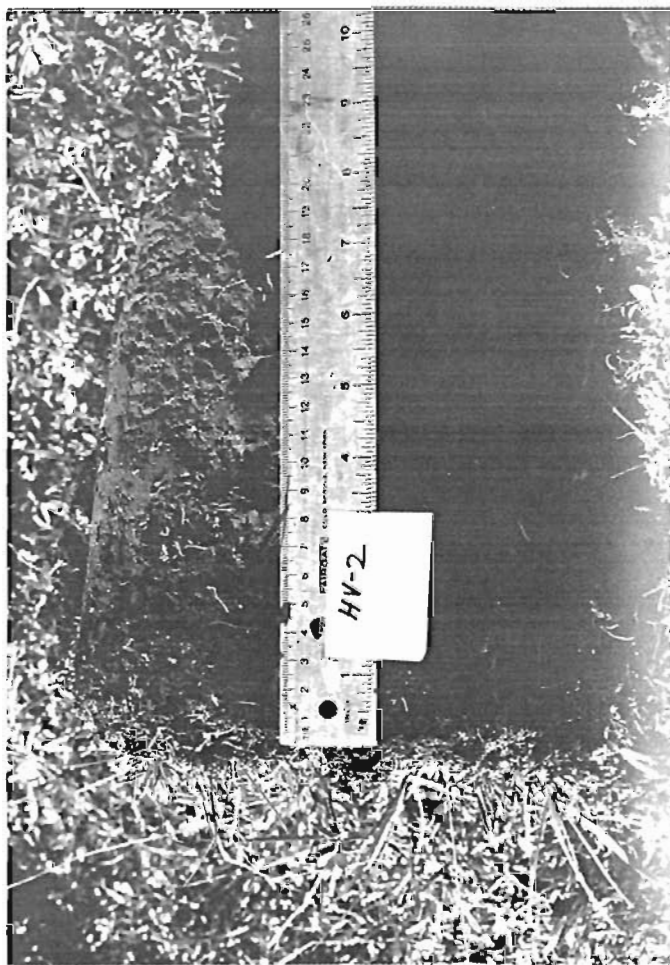


Soil Profile, Relevé HV-1

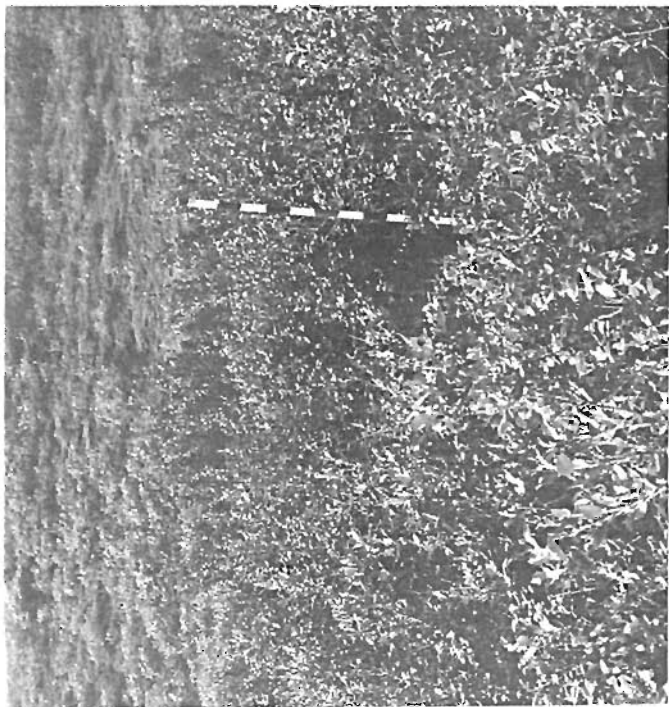


Landscape Relevé HV-2

Soil Profile HV-2

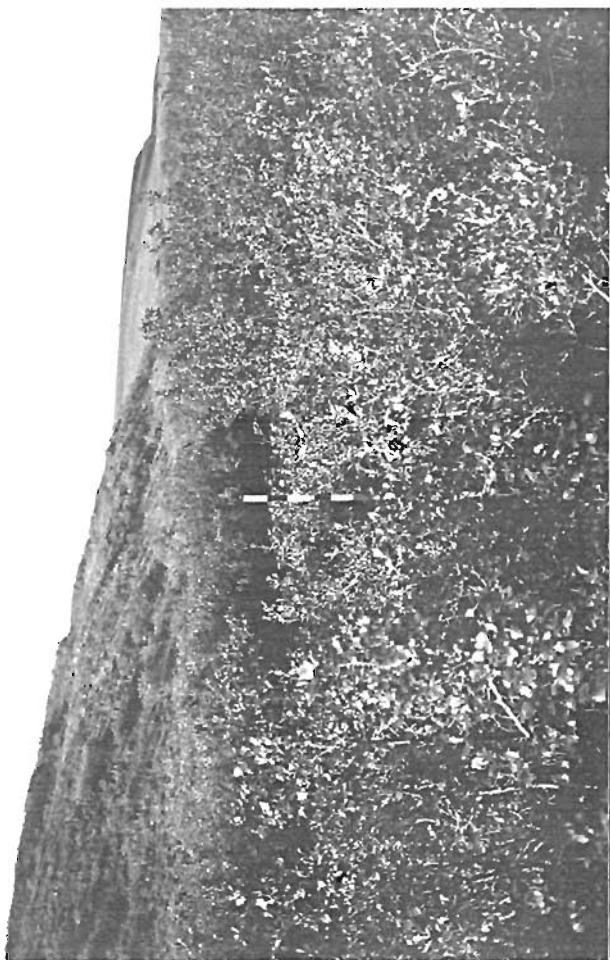


Landscape Relevé HV-3



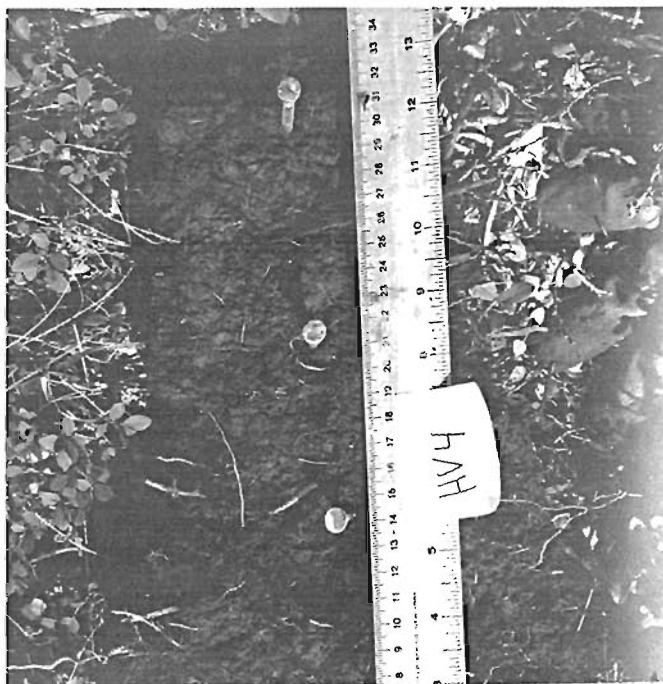
Landscape Relevé HV-5

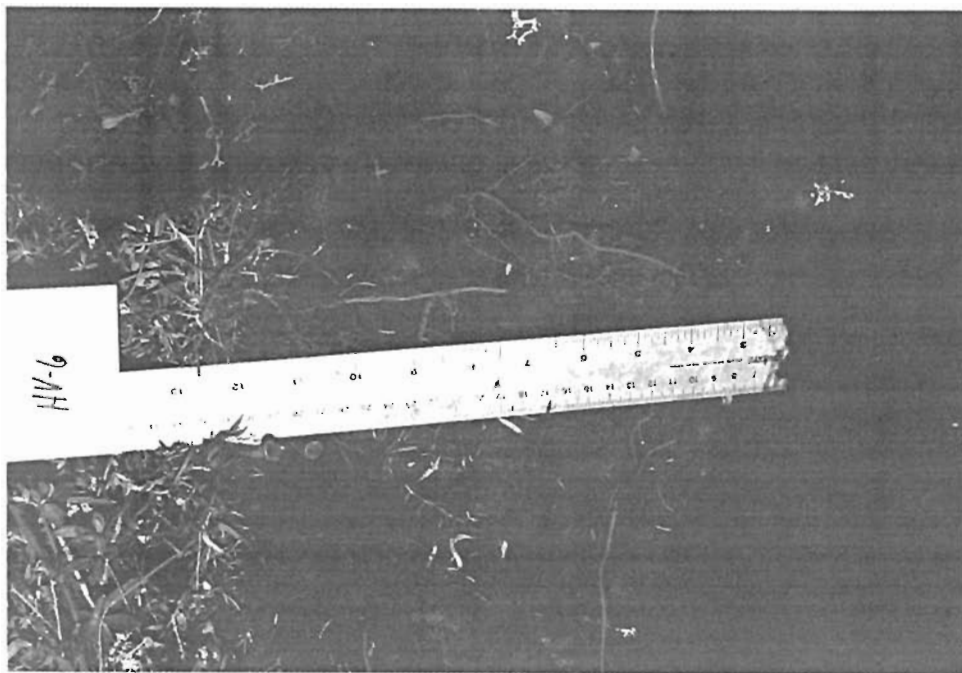
Close-Up Vegetation HV-5



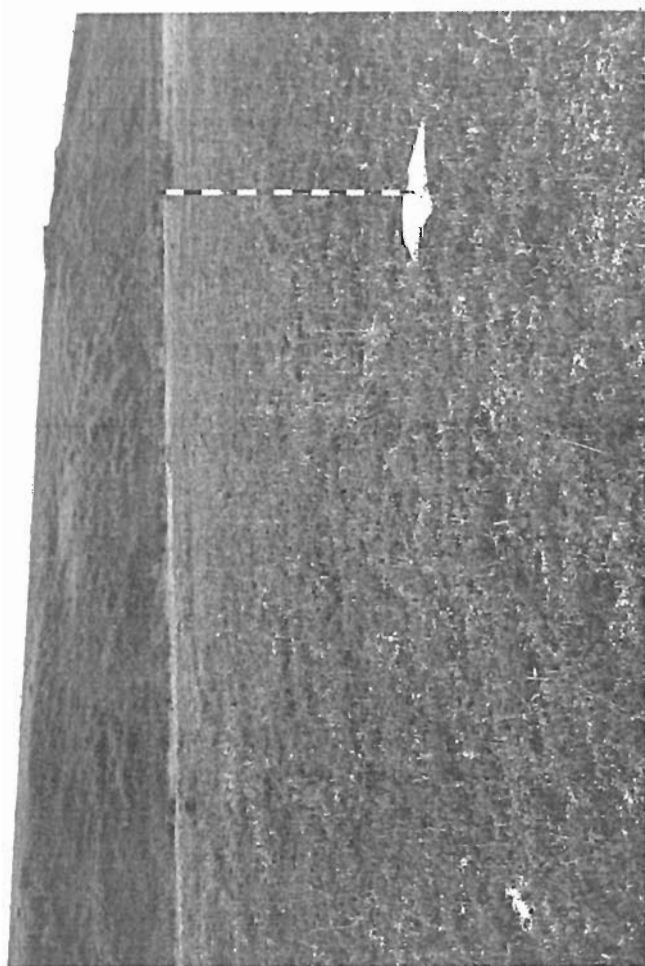
Landscape Relevé HV-4

Soil Profile HV-4



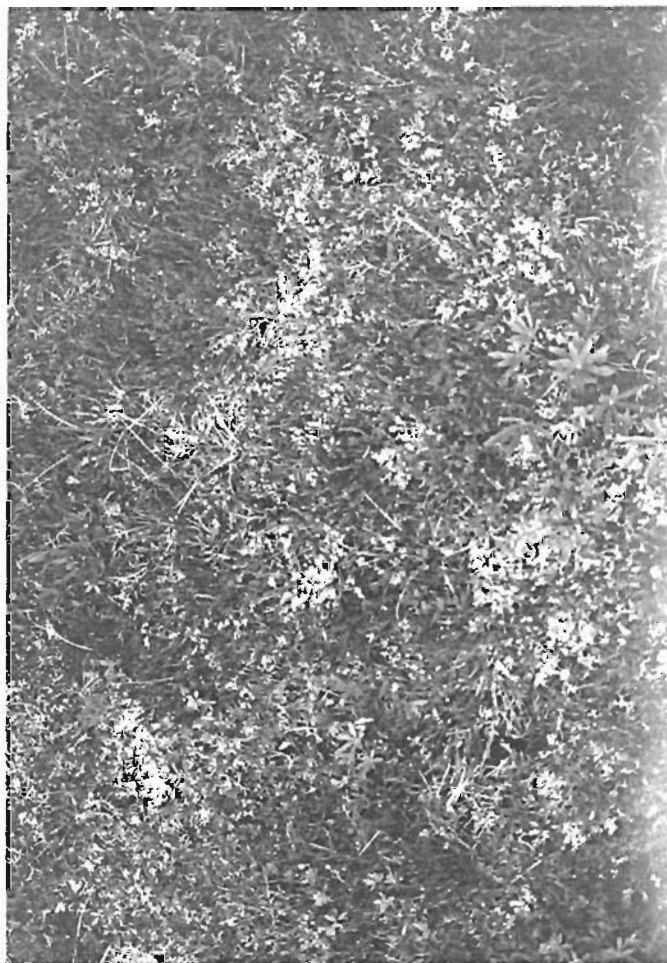


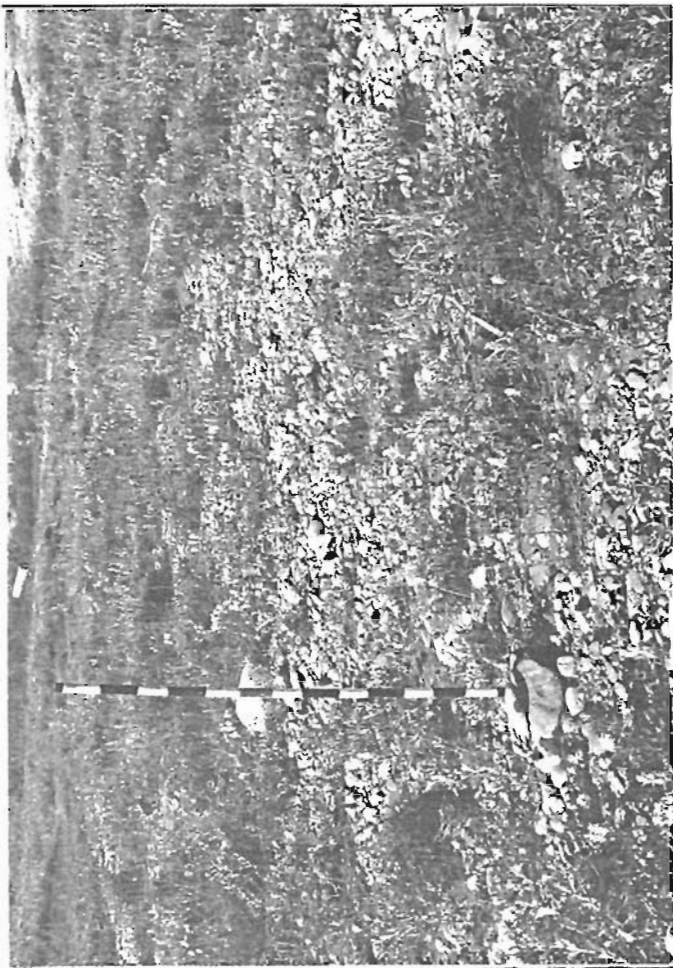
Soil Profile HV-6



Landscape Relevé HV-6

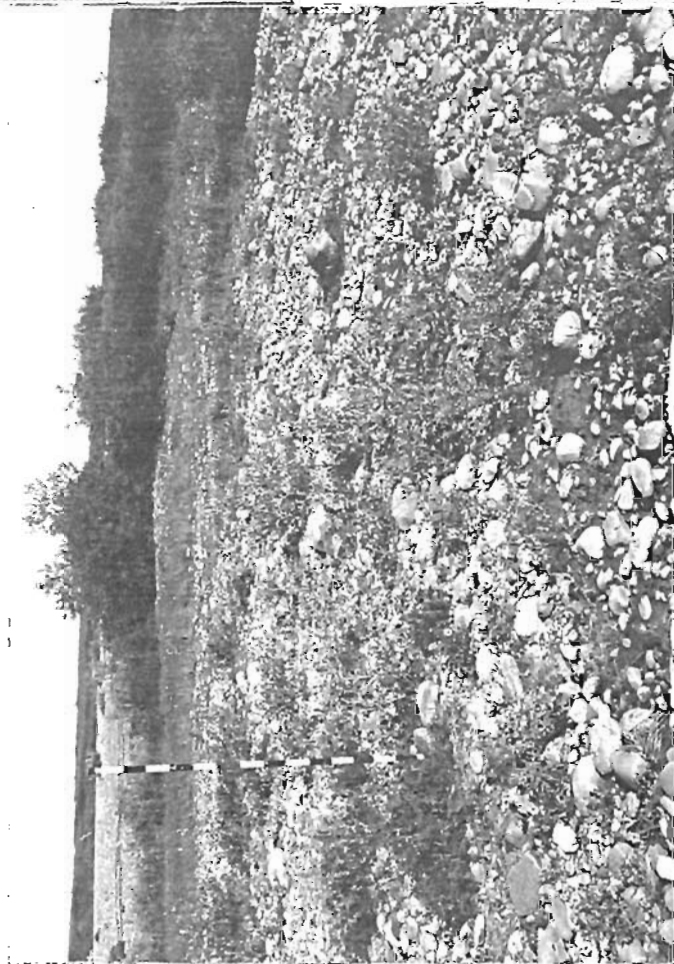
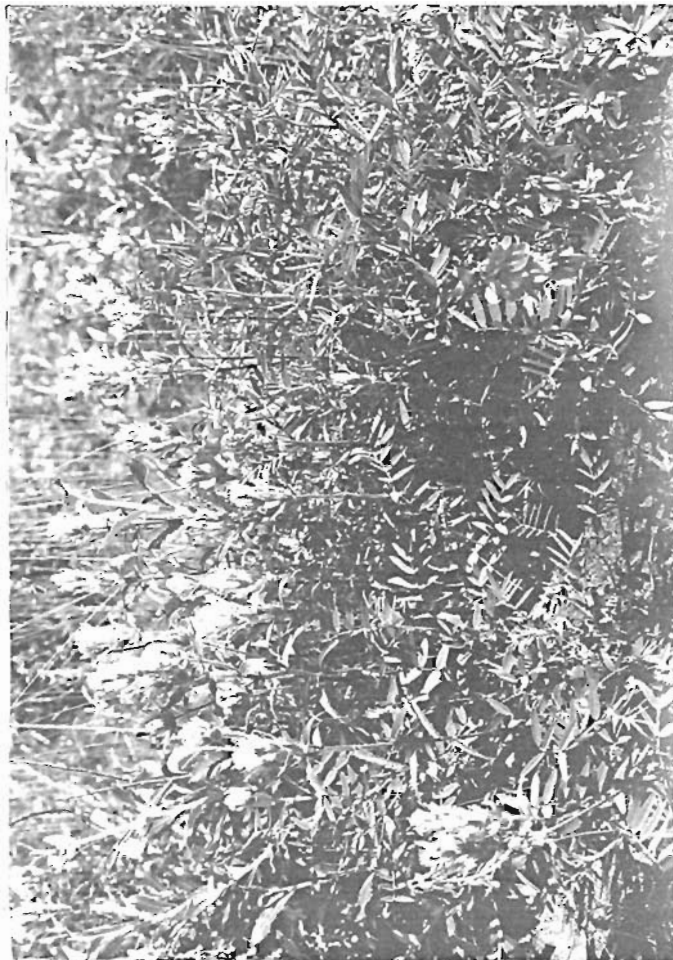
Close-up Vegetation HV-6



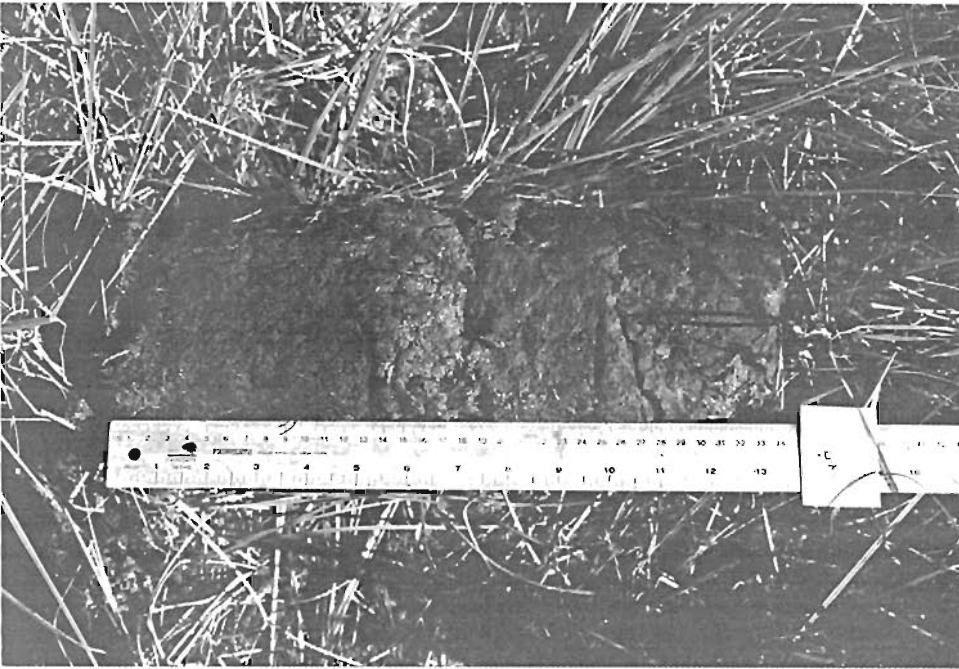


Landscape Relevé HV-8

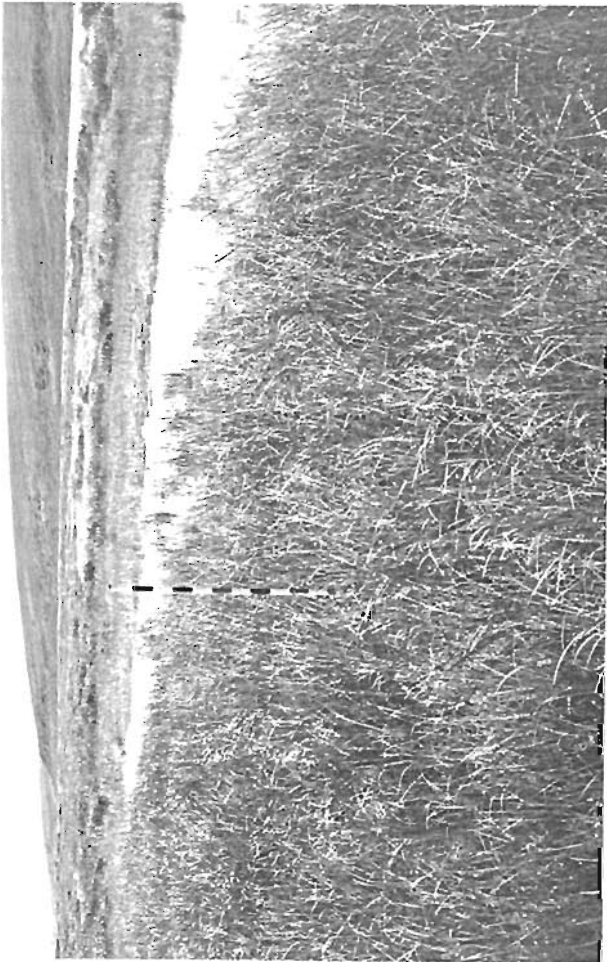
Close-up Vegetation HV-8



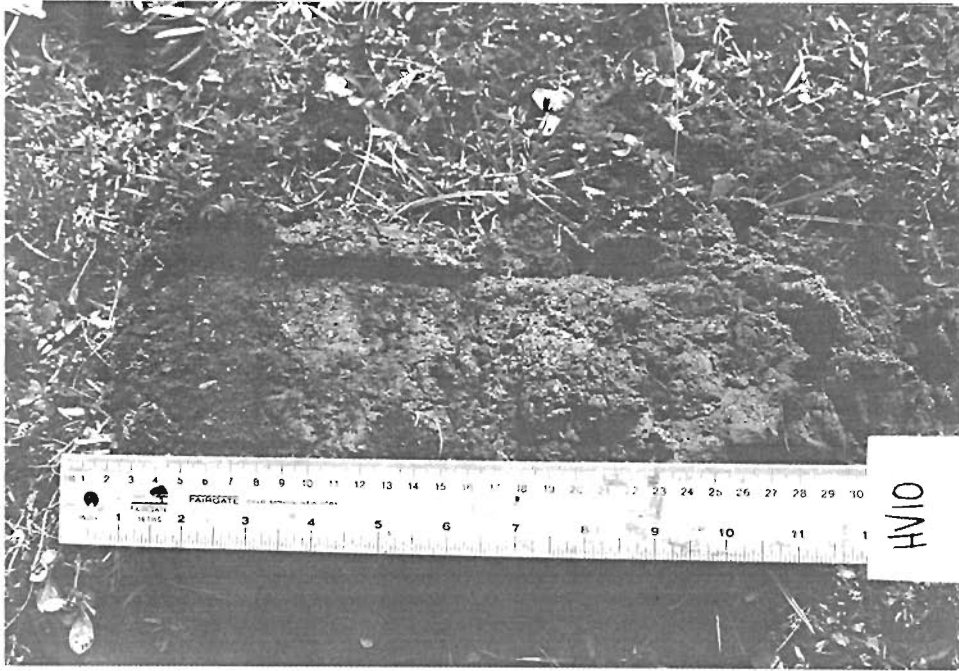
Landscape Relevé HV-7



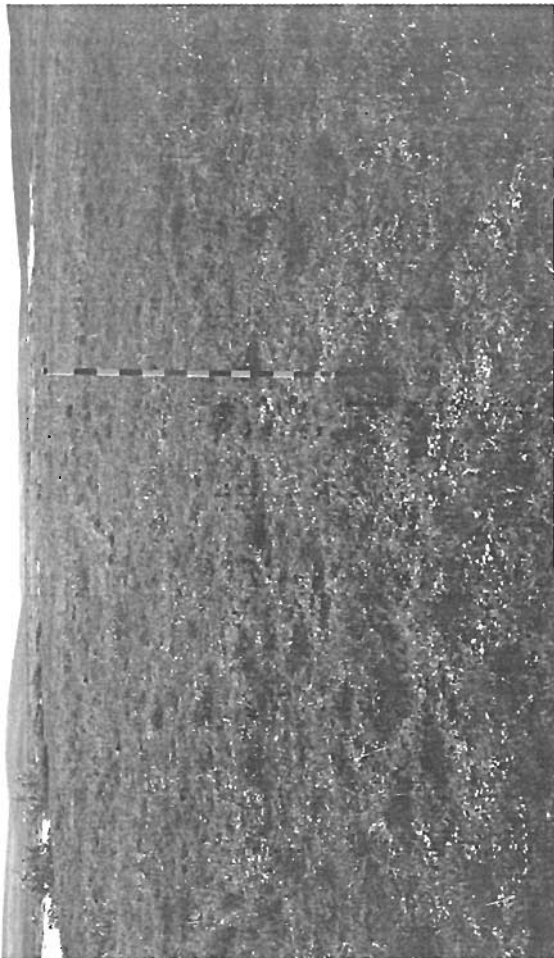
Soil Profile HV-9



Landscape Relevé HV-9

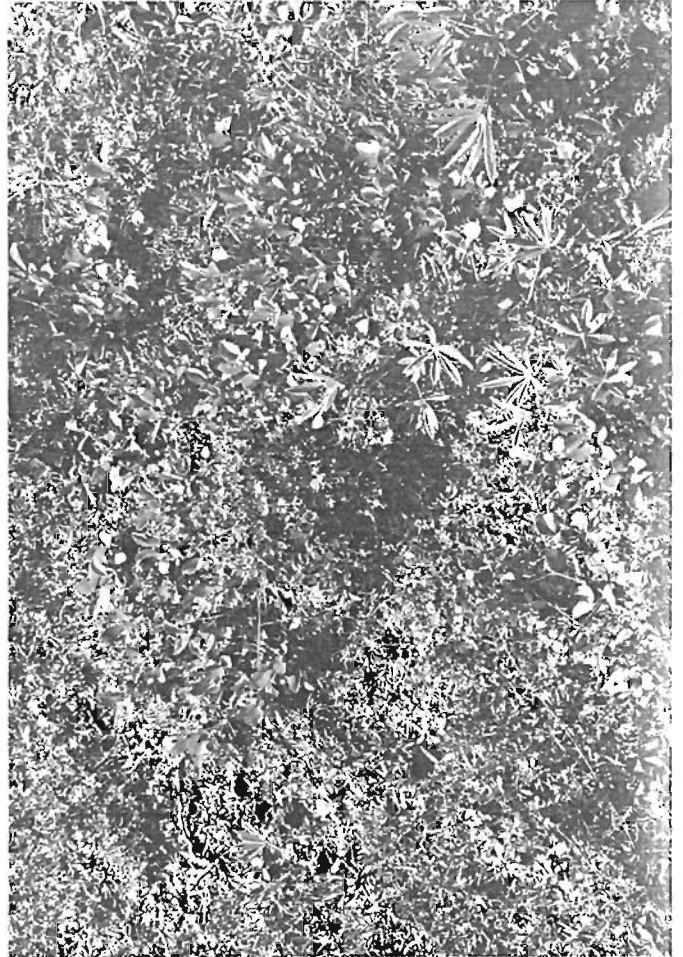


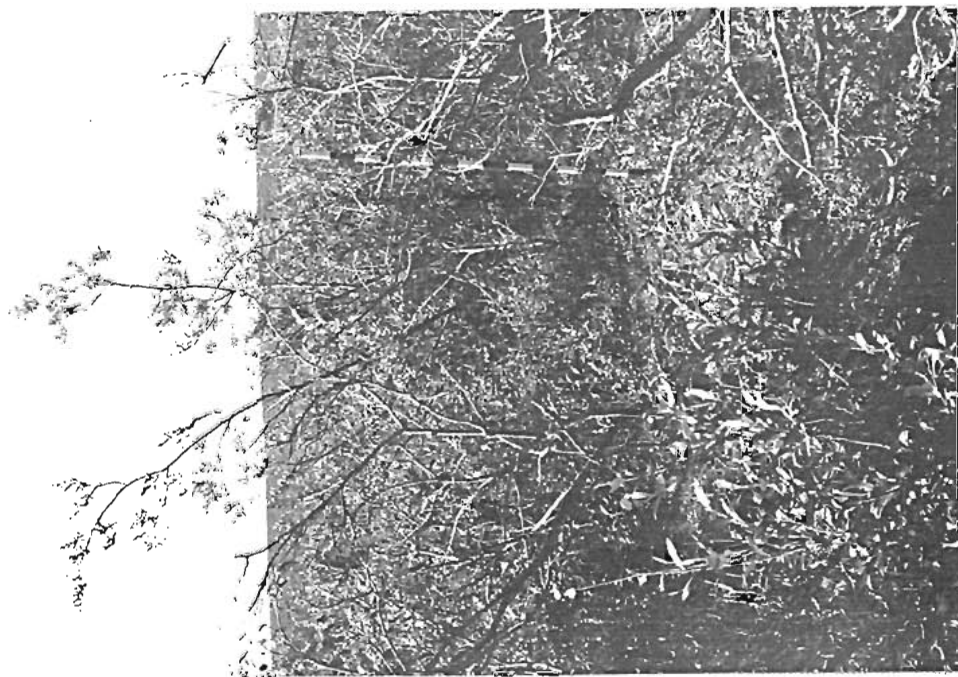
Soil Profile HV-10



Landscape Relevé HV-10

Close-up Vegetation HV-10





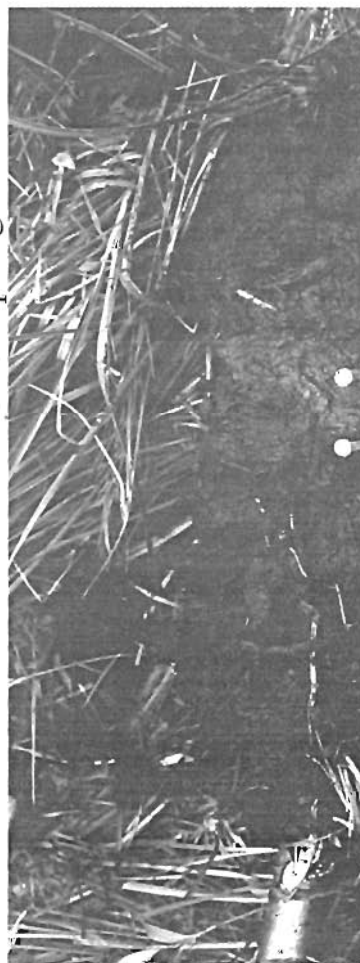
Landscape Relevé HV-11



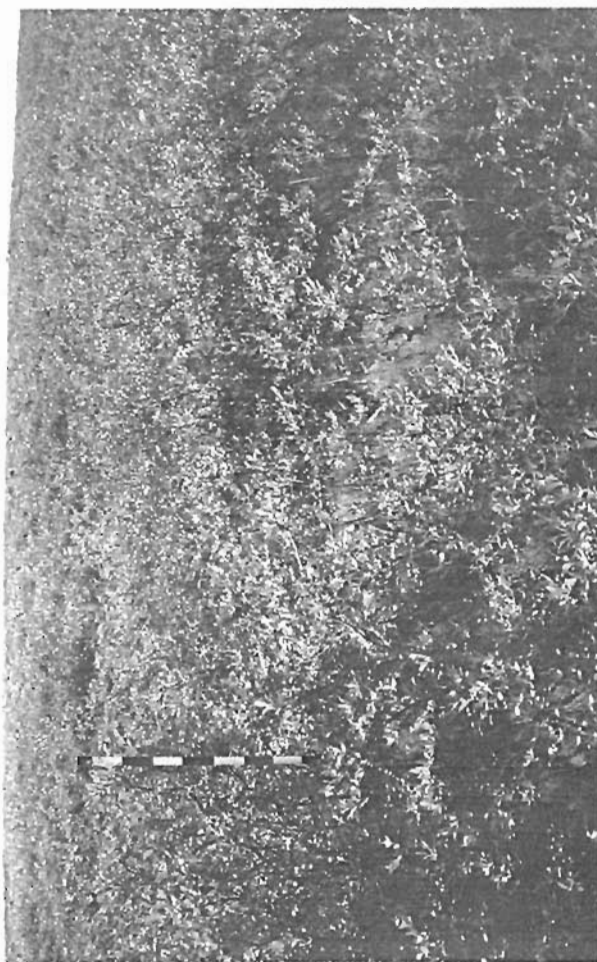
Soil Profile HV-11



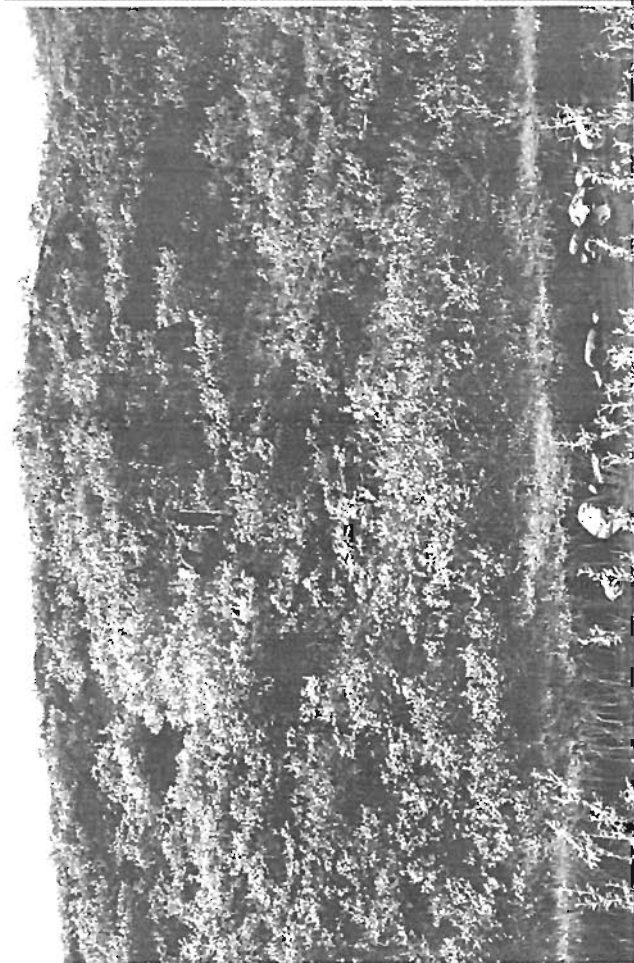
Close-up Vegetation HV-12



Soil Profile HV-12



Landscape Relevé HV-12

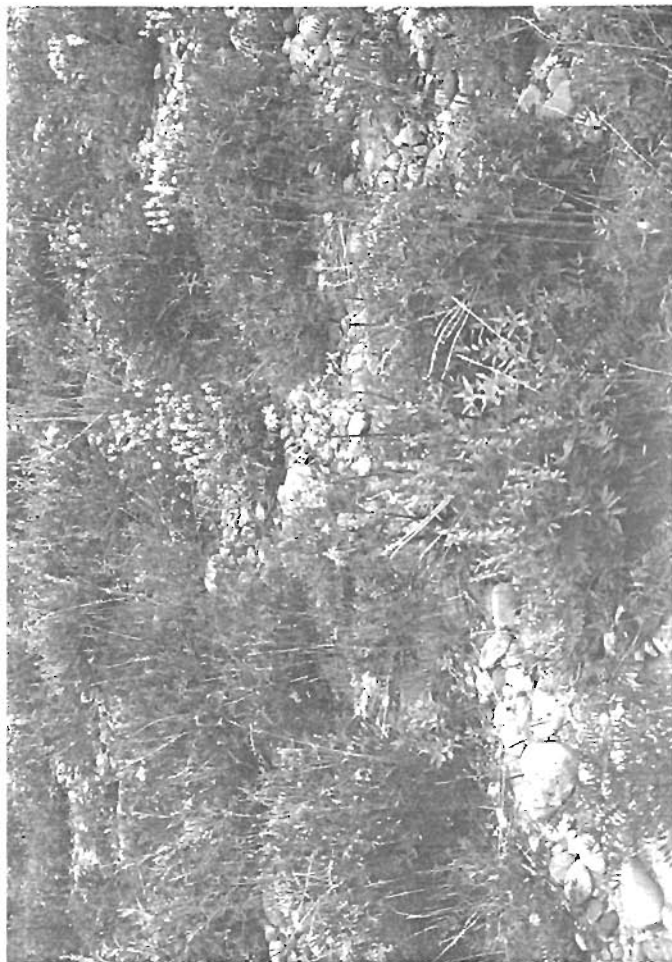


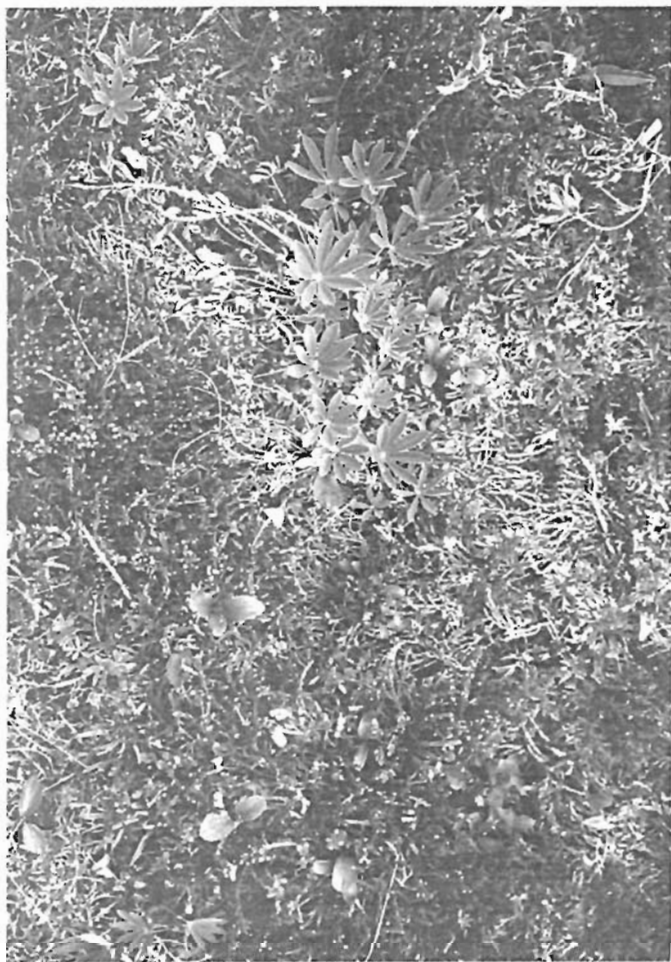
Landscape Relevé HV-13



Landscape Relevé HV-16

Close-up Vegetation HV-16

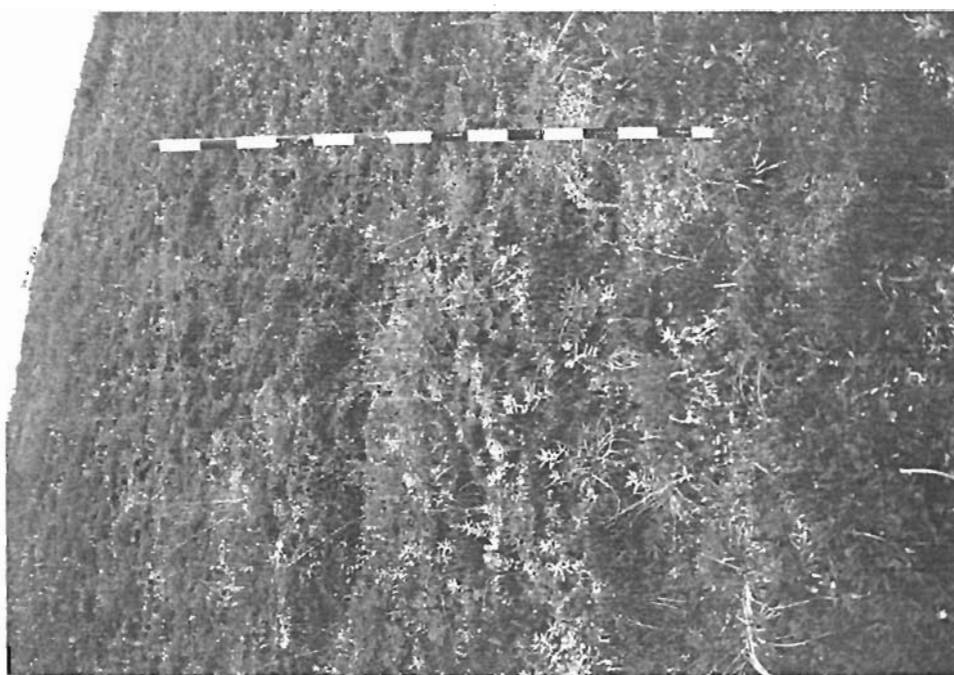




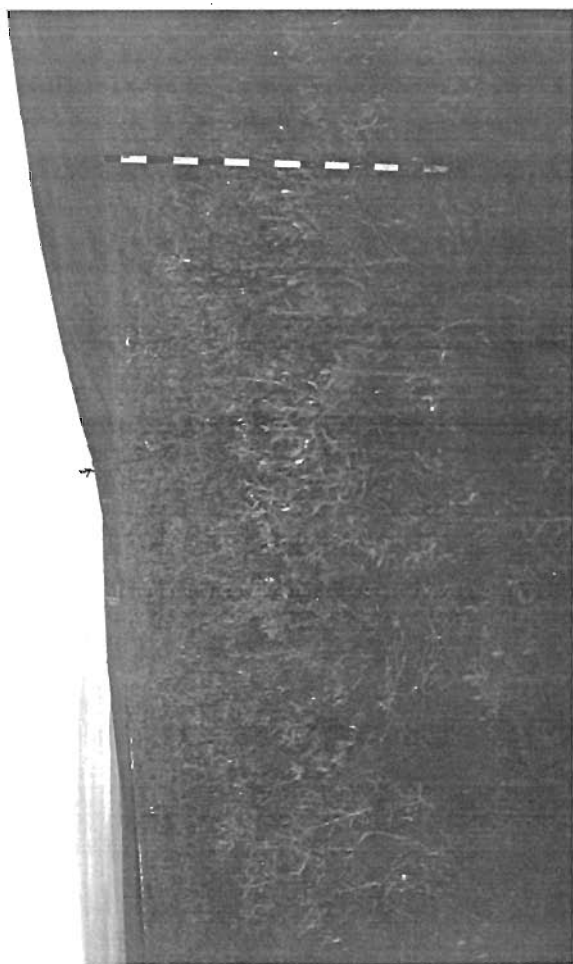
Close-up Vegetation HV-17



Soil Profile HV-17

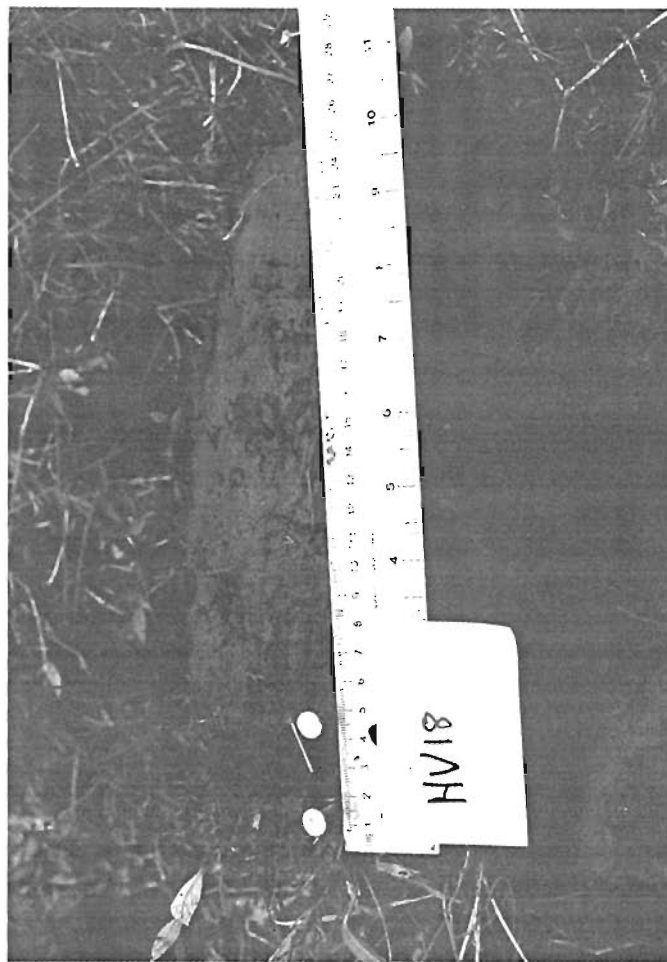


Landscape Relevé HV-17

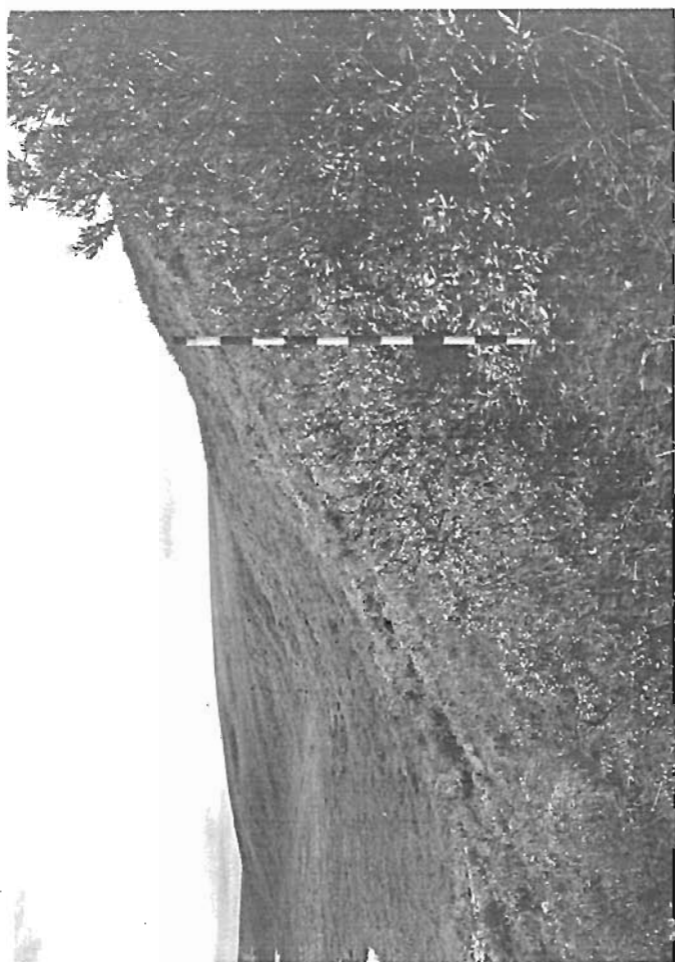


Landscape Relevé HV-18

Close-up Vegetation HV-18

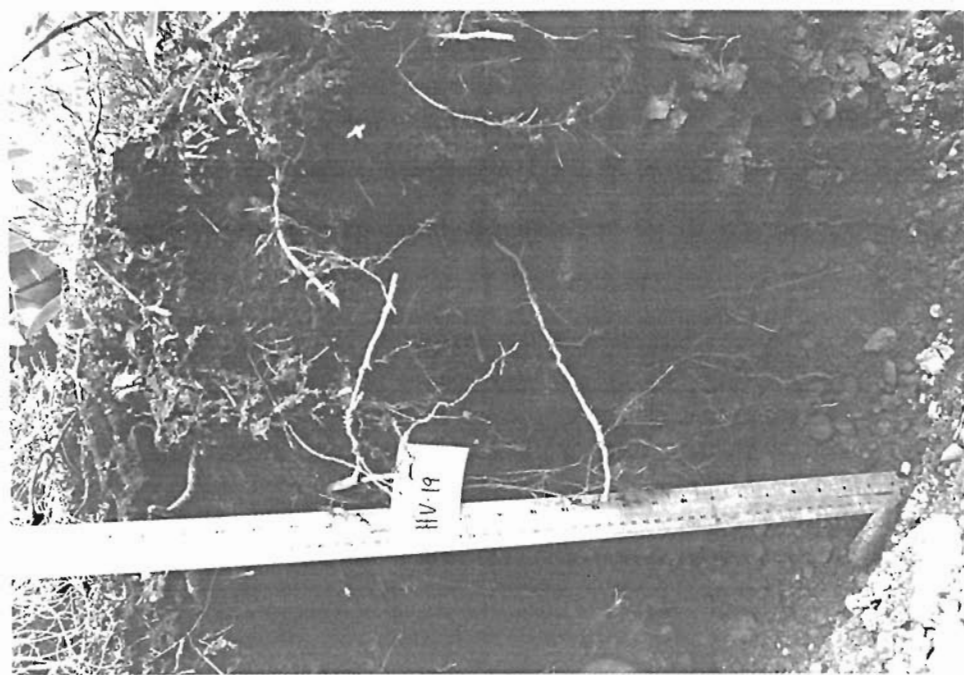
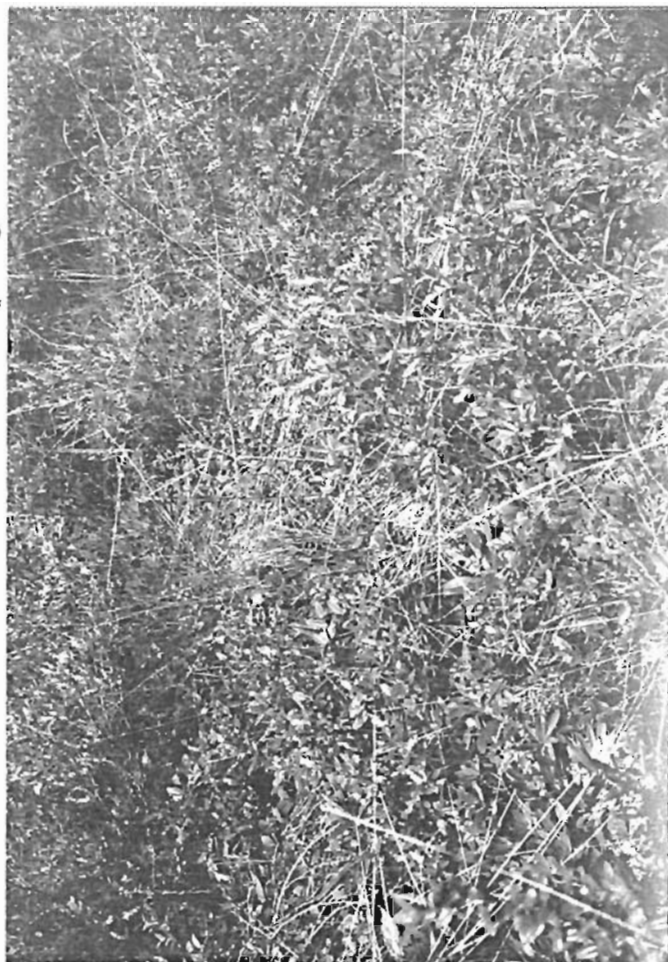


Soil Profile HV-18

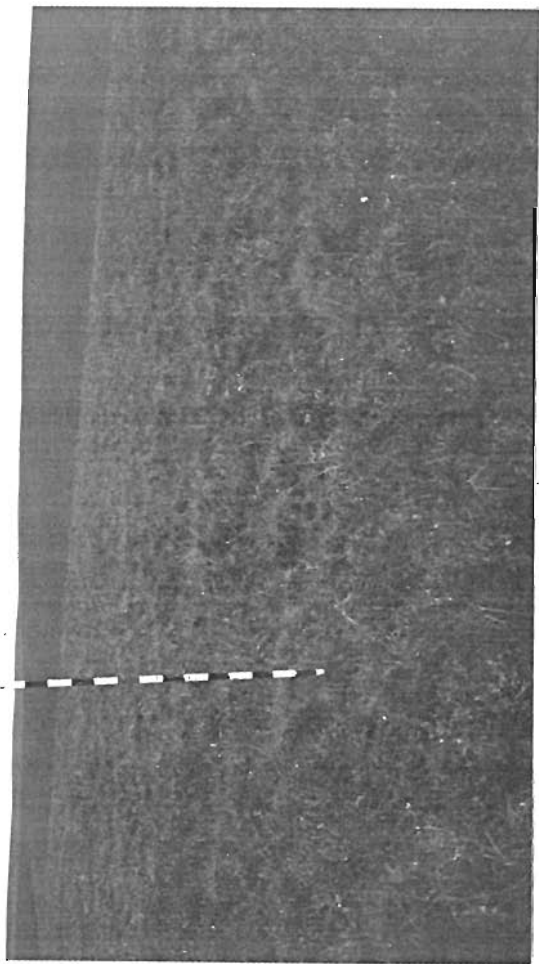


Landscape Relevé HV-19

Close-up Vegetation HV-19

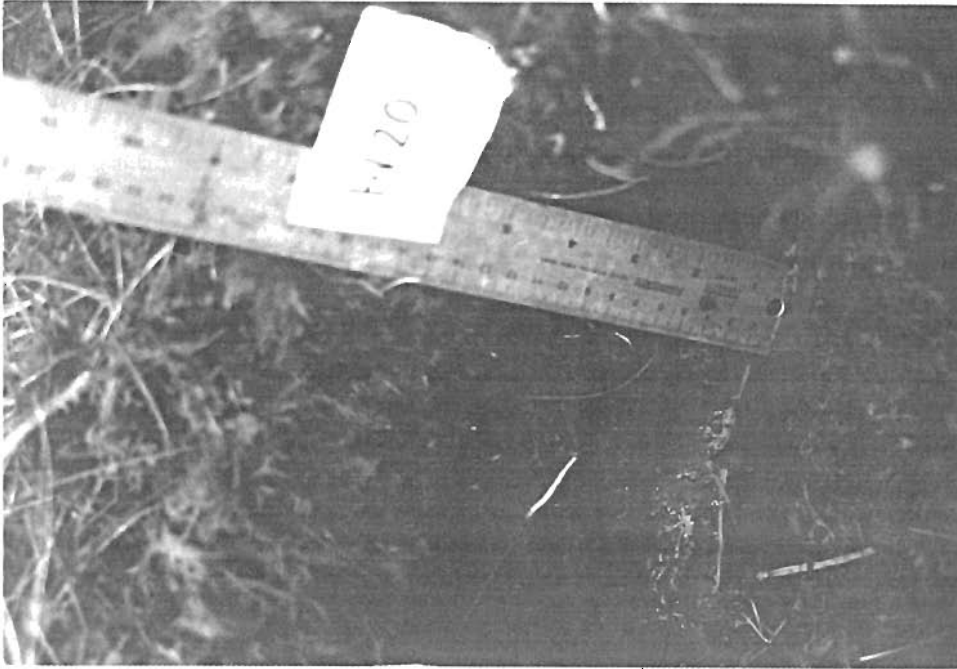


Soil Profile HV-19

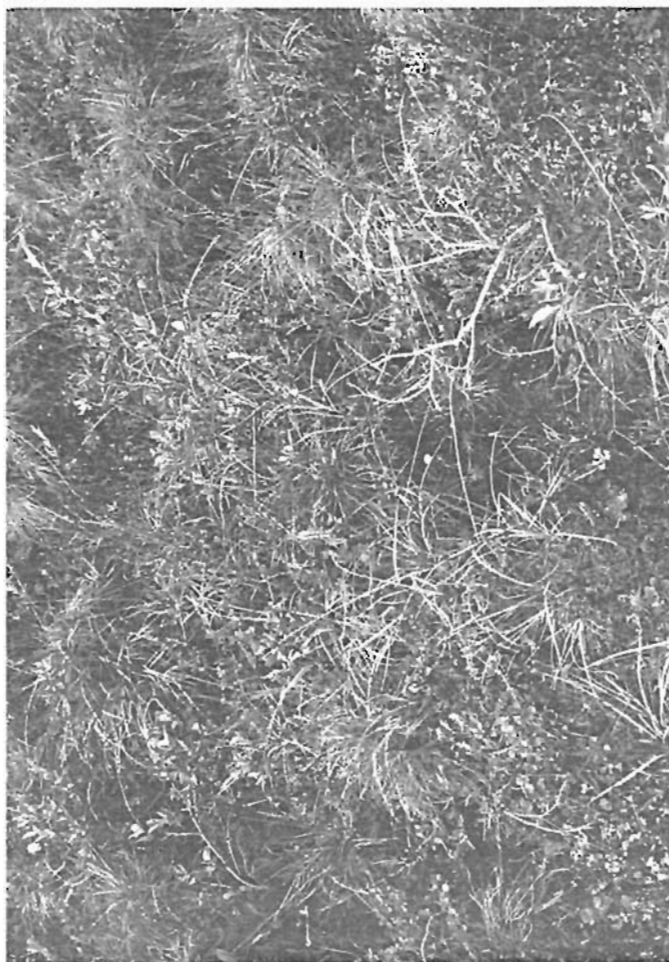


Landscape Relevé HV-20

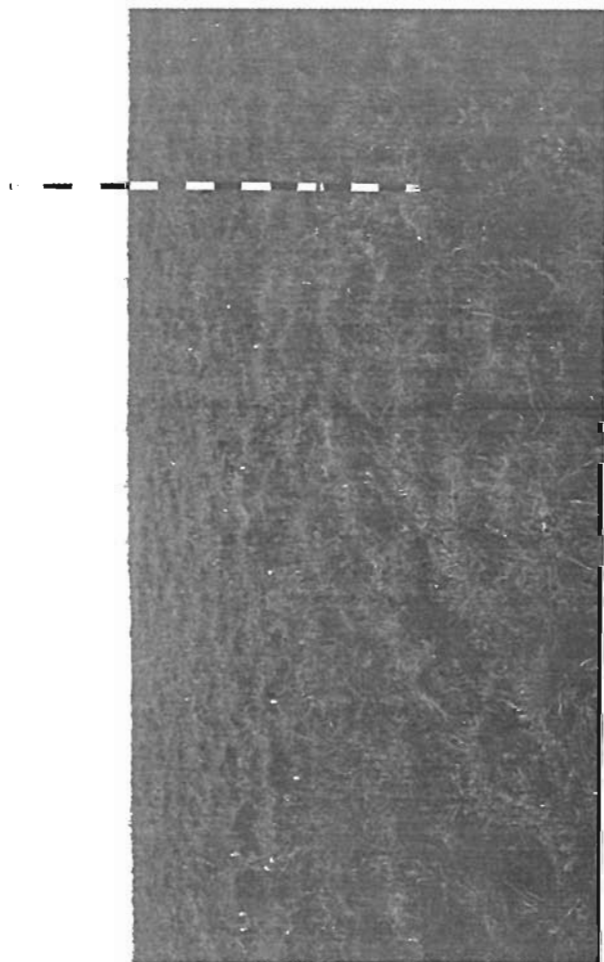
Close-up Vegetation HV-20



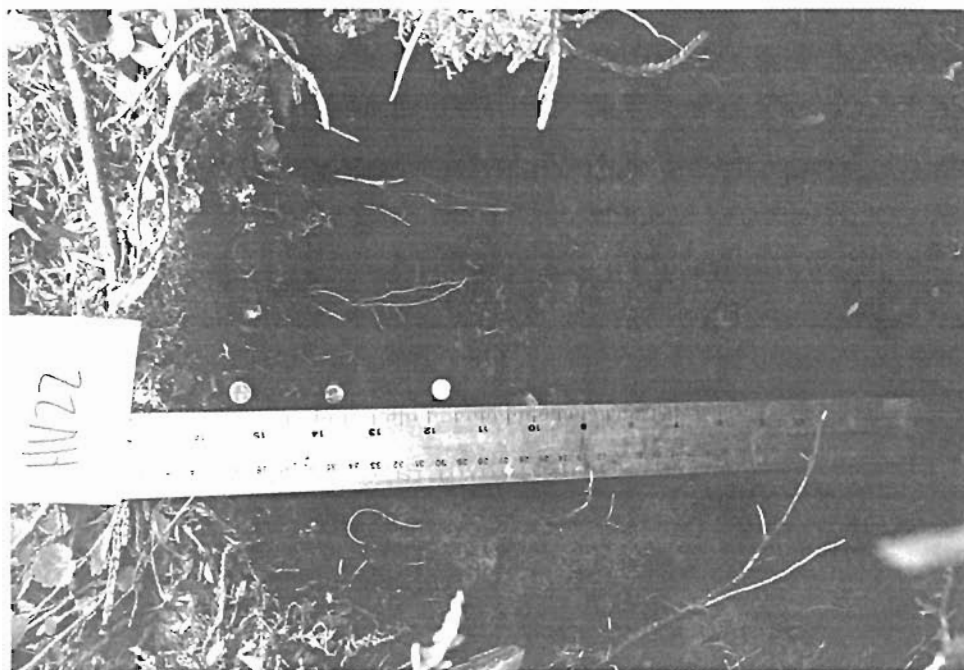
Soil Profile HV-20



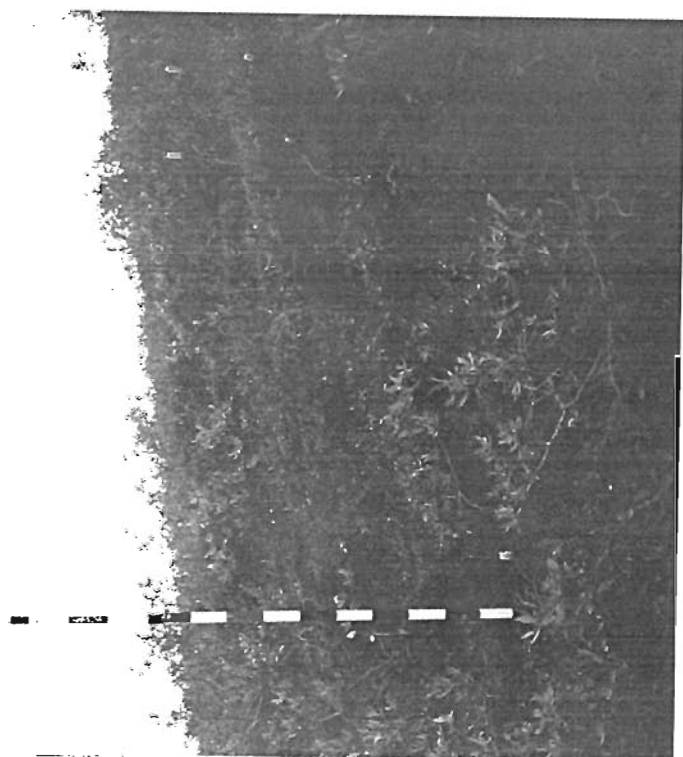
Close-up Vegetation HV-21



Landscape Relevé HV-21



Soil Profile HV-22



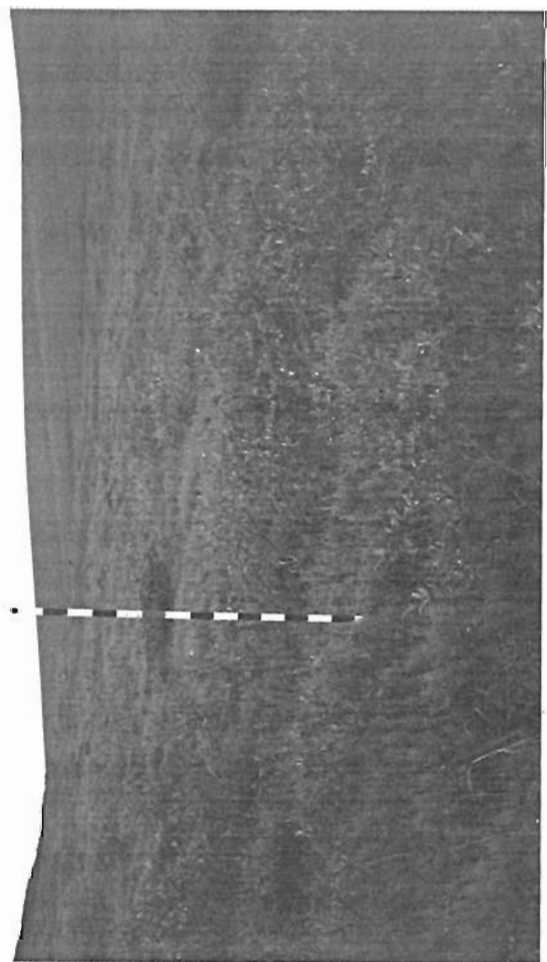
Landscape Relevé HV-22

Close-up Vegetation HV-22





Soil Profile HV-23



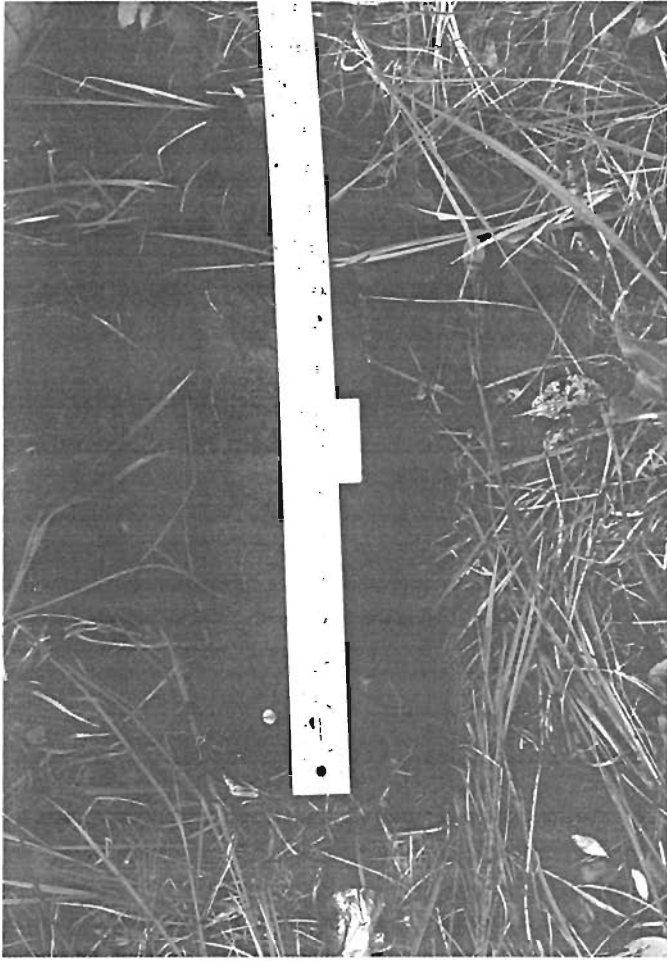
Landscape Relevé HV-23



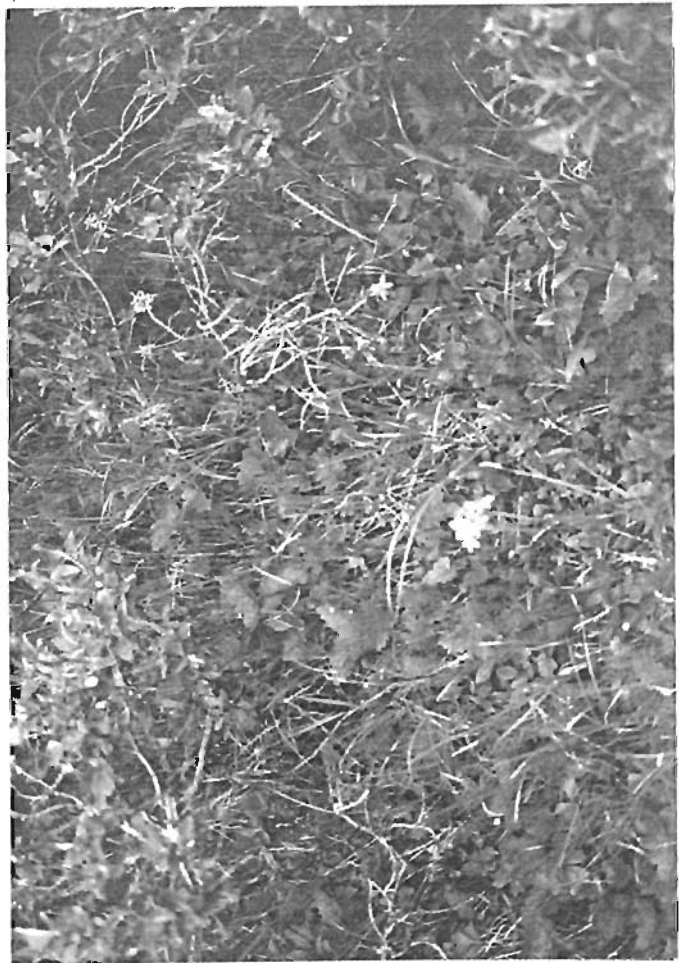
Close-up Vegetation HV-23



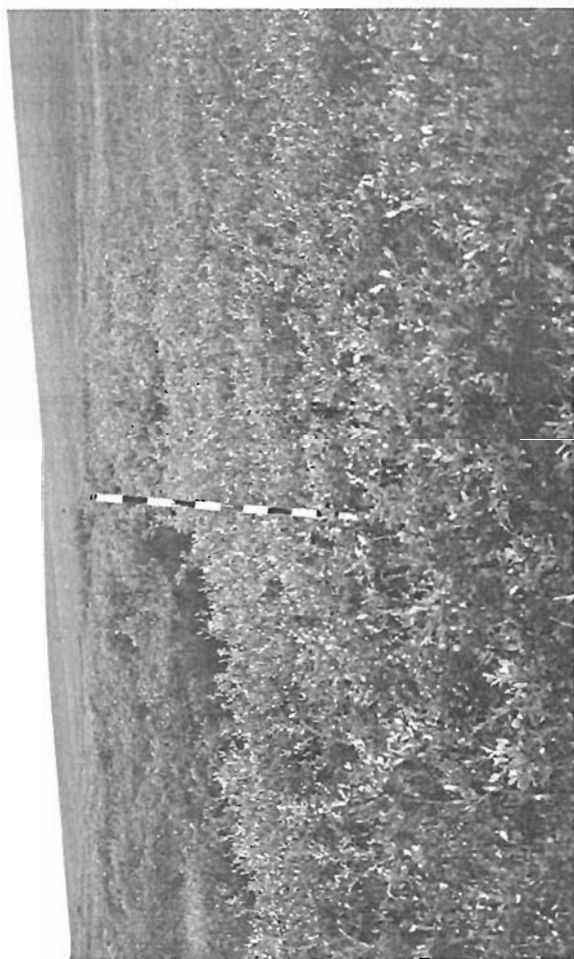
Landscape Relevé HV-24



Soil Profile HV-24



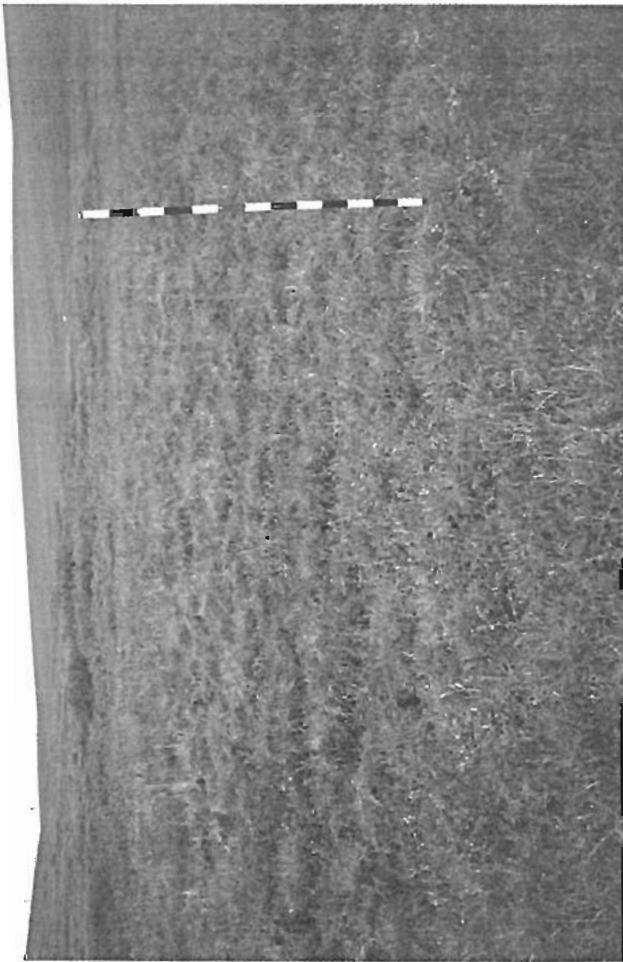
Close-up Vegetation HV-24



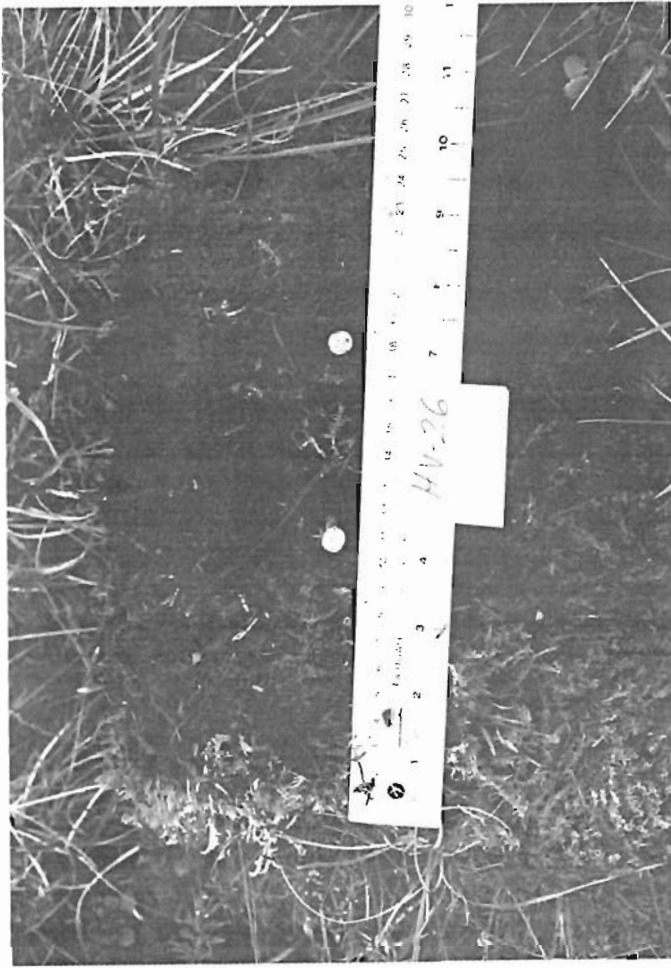
Landscape Relevé HV-25



Close-up Vegetation HV-25



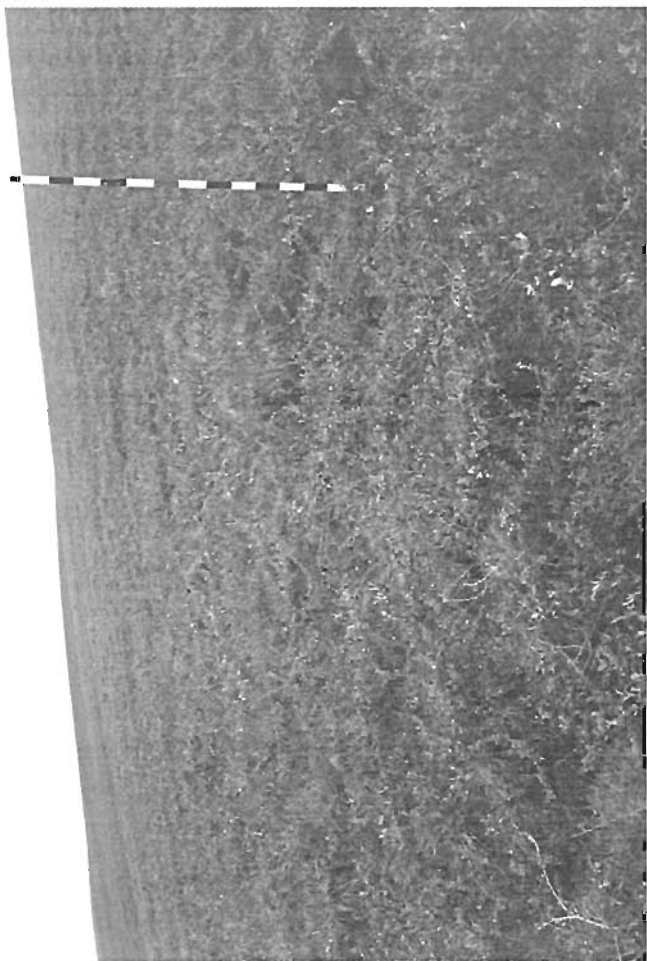
Landscape Relevé HV-26



Soil Profile HV-26

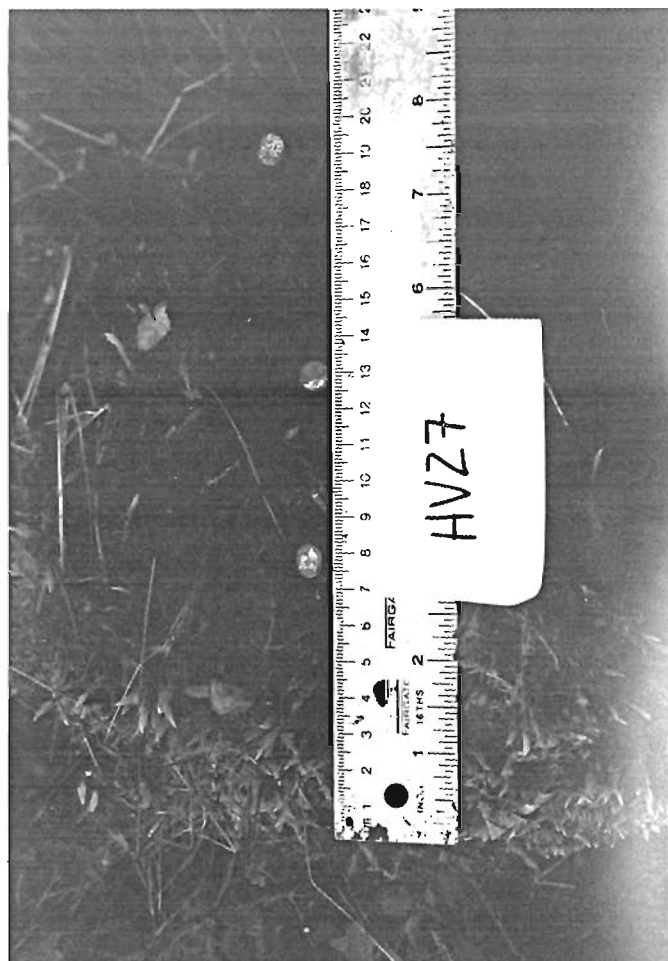


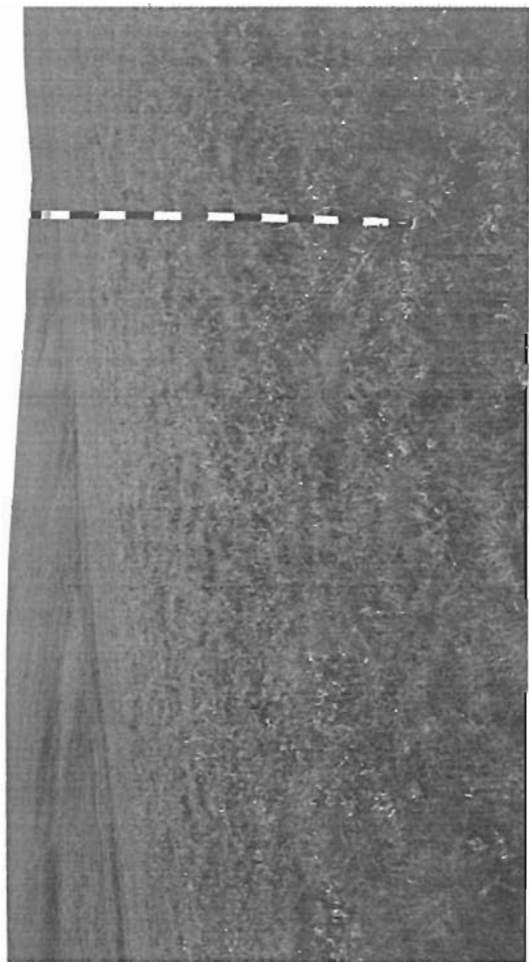
Close-up Vegetation HV-26



Landscape Relevé HV-27

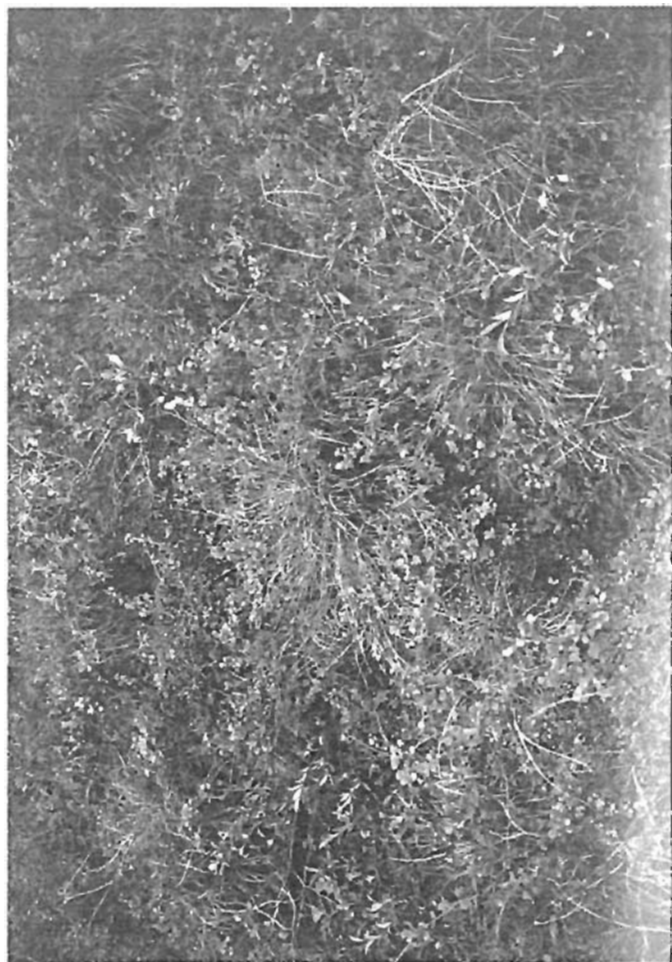
Soil Profile HV-27





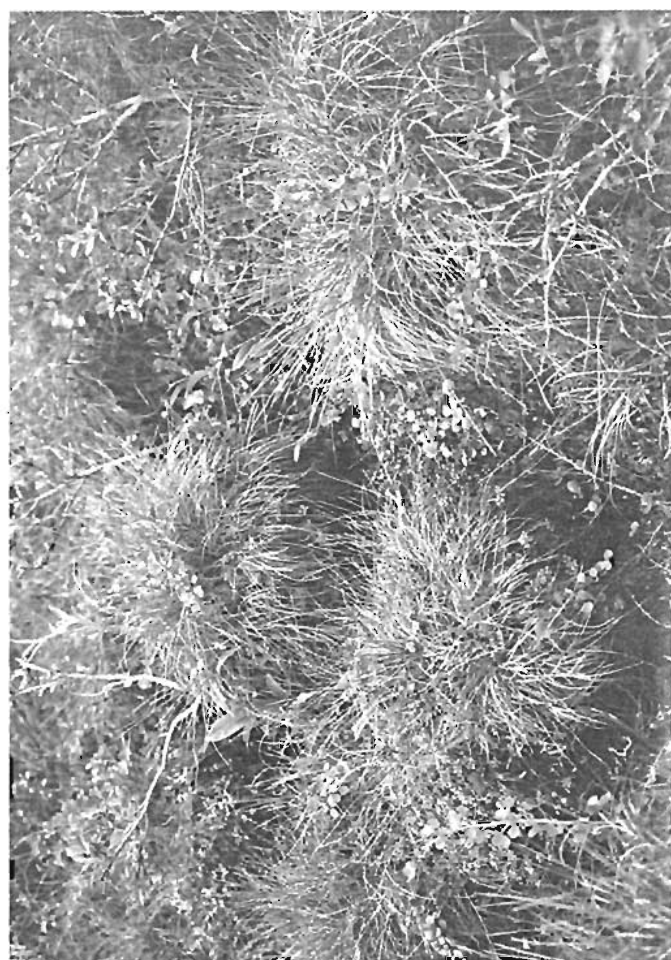
Landscape Relevé HV-28

Close-up Vegetation HV-28

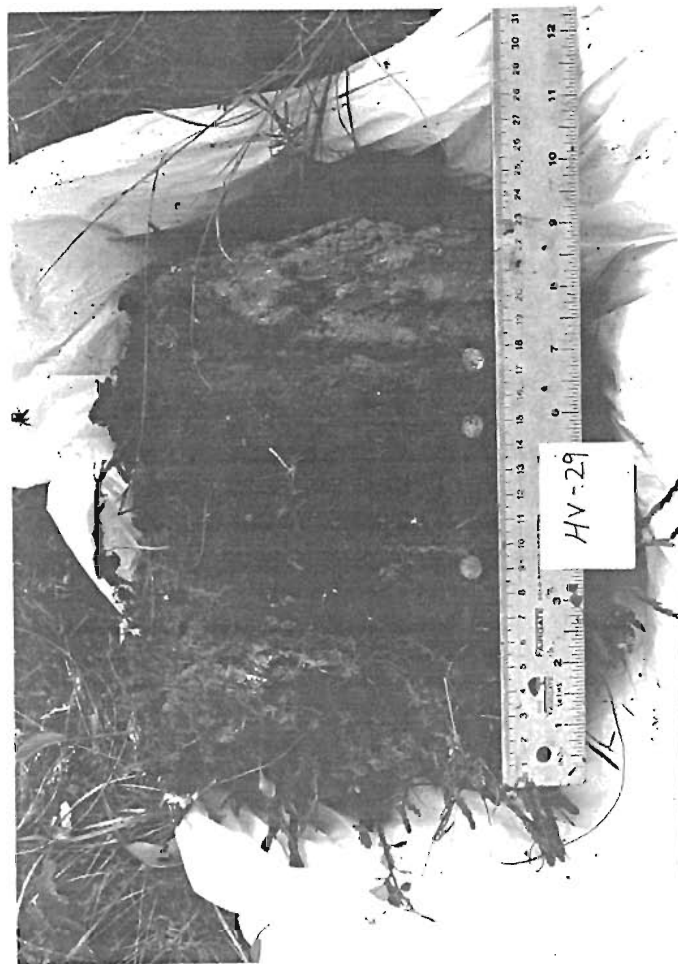




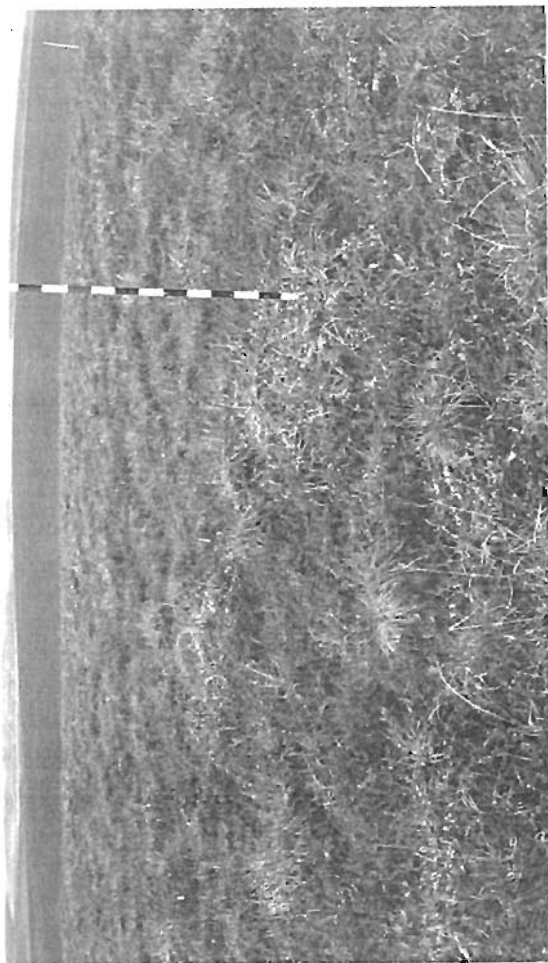
Landscape Relevé HV-29



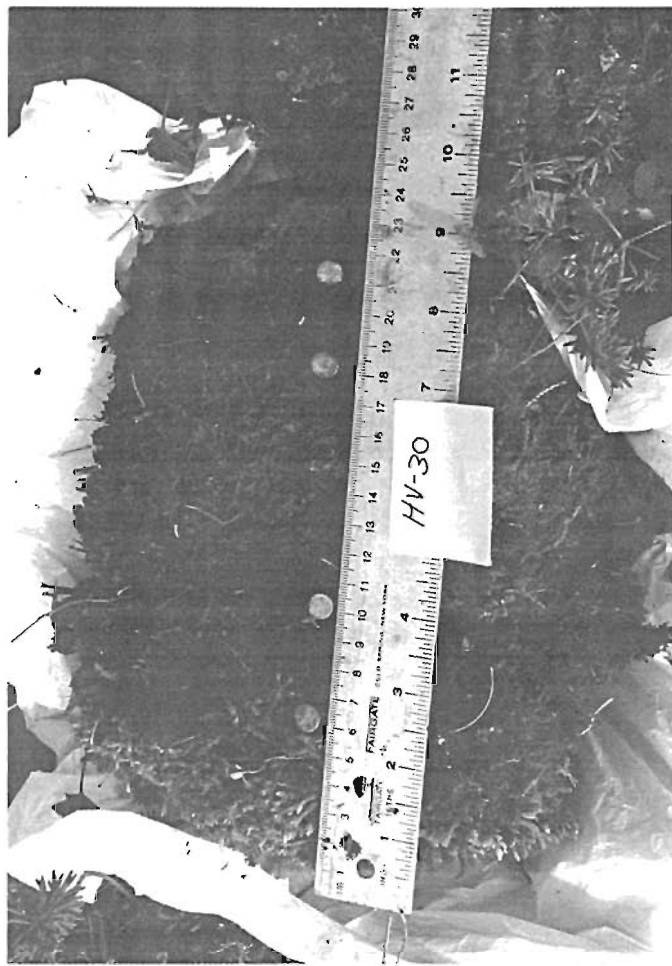
Close-up Vegetation HV-29



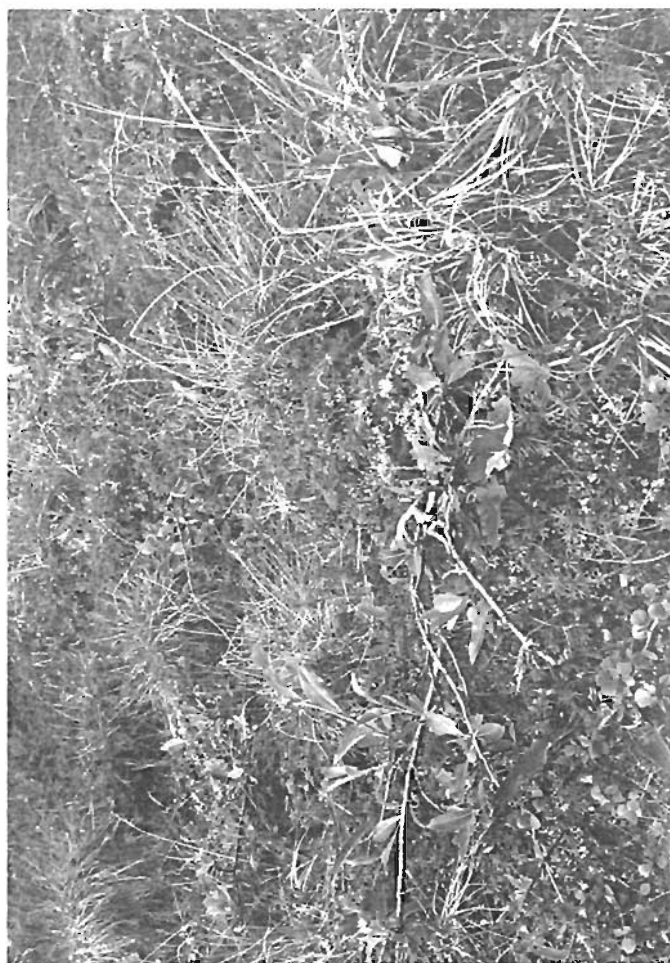
Soil Profile HV-29



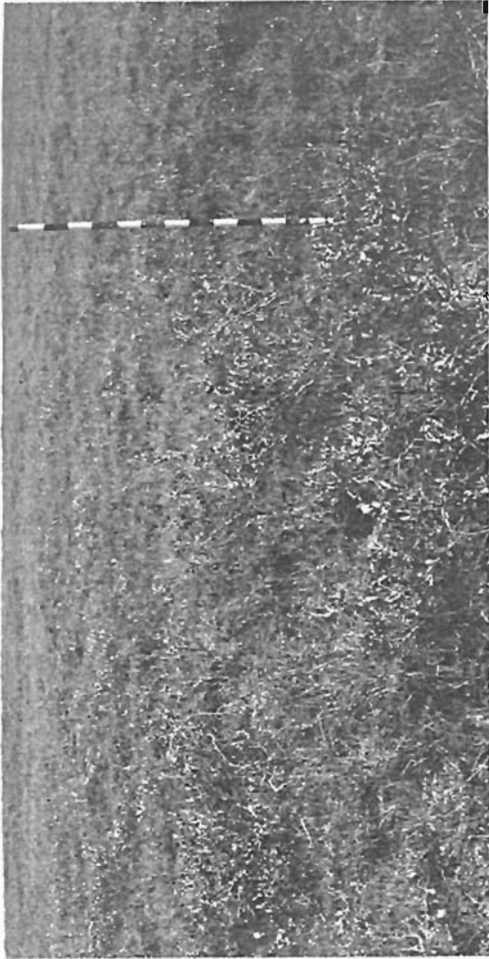
Landscape Relevé HV-30



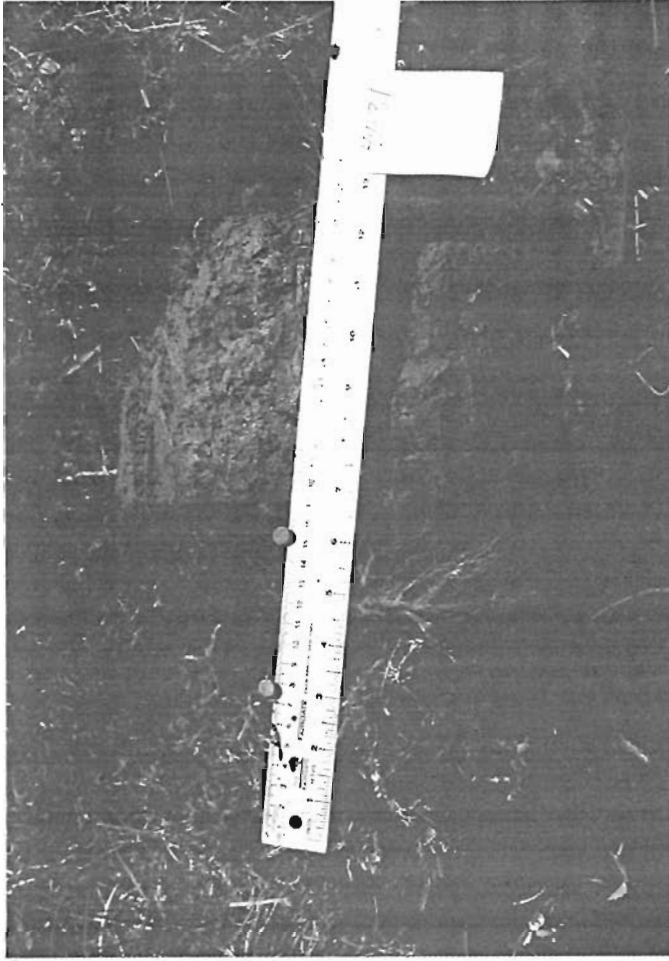
Soil Profile HV-30



Close-up Vegetation HV-30



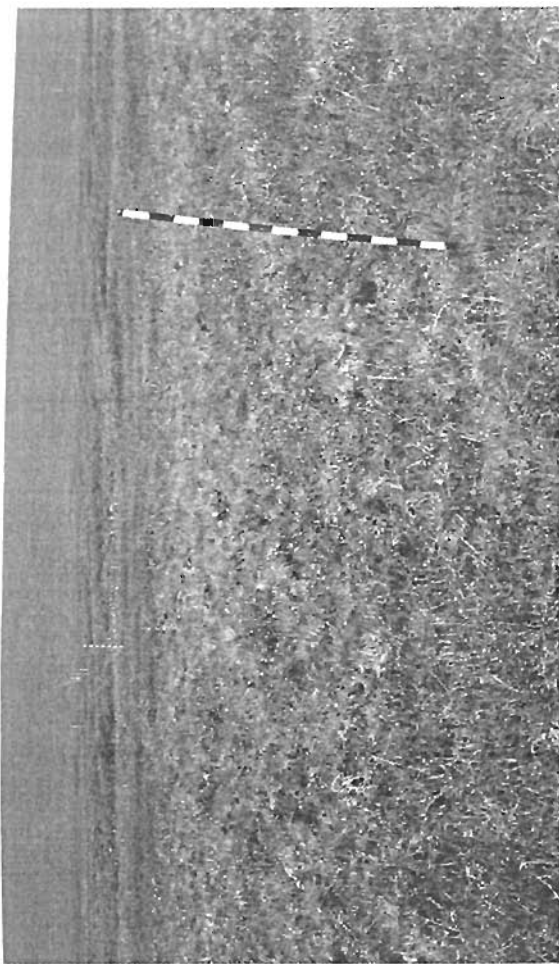
Landscape Relevé HV-31



Soil Profile HV-31

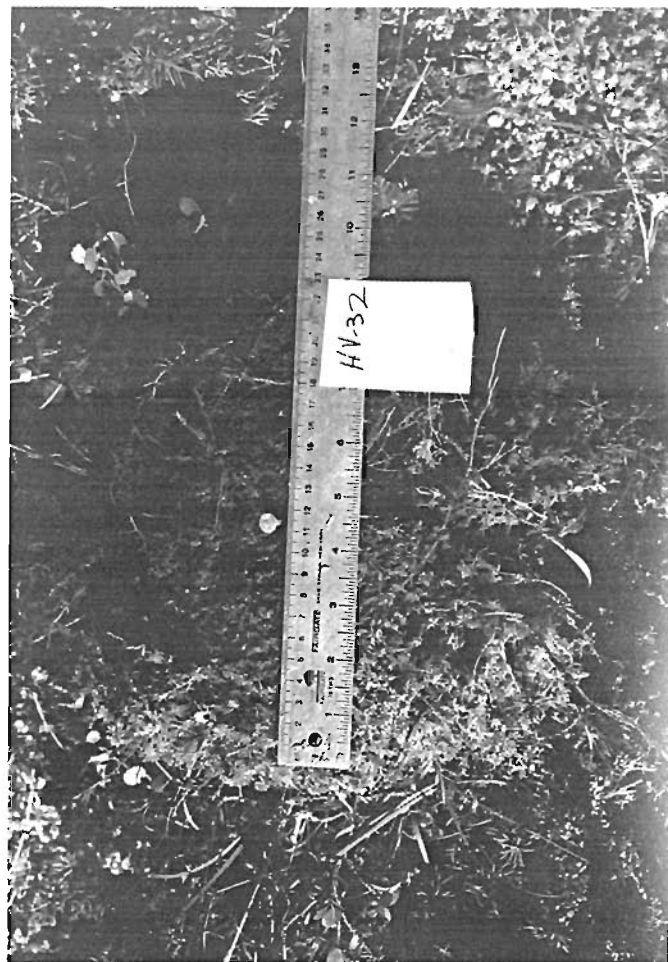


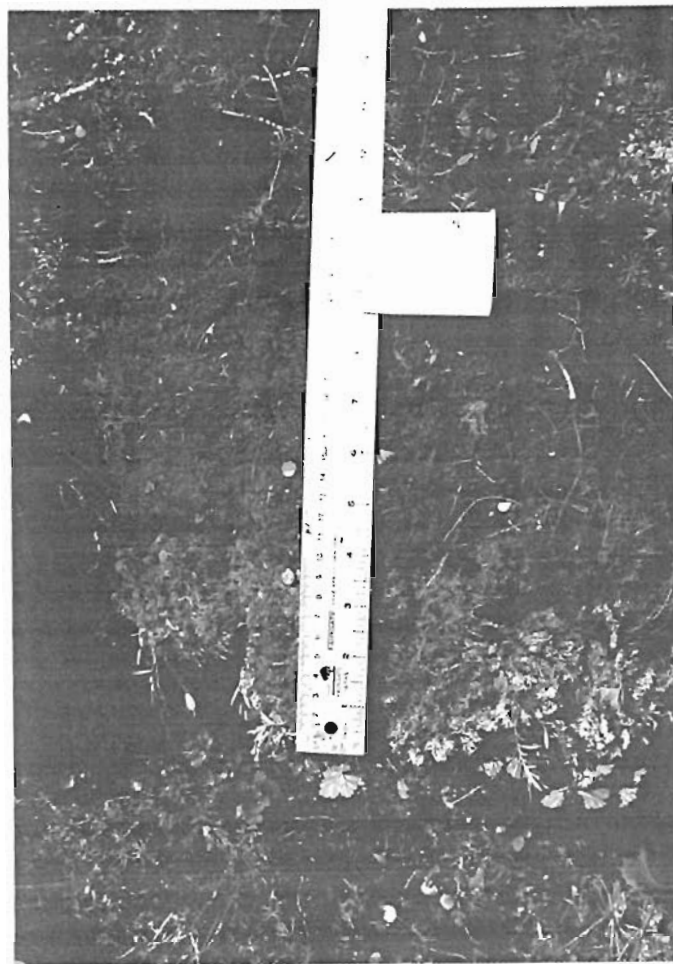
Close-up Vegetation HV-31



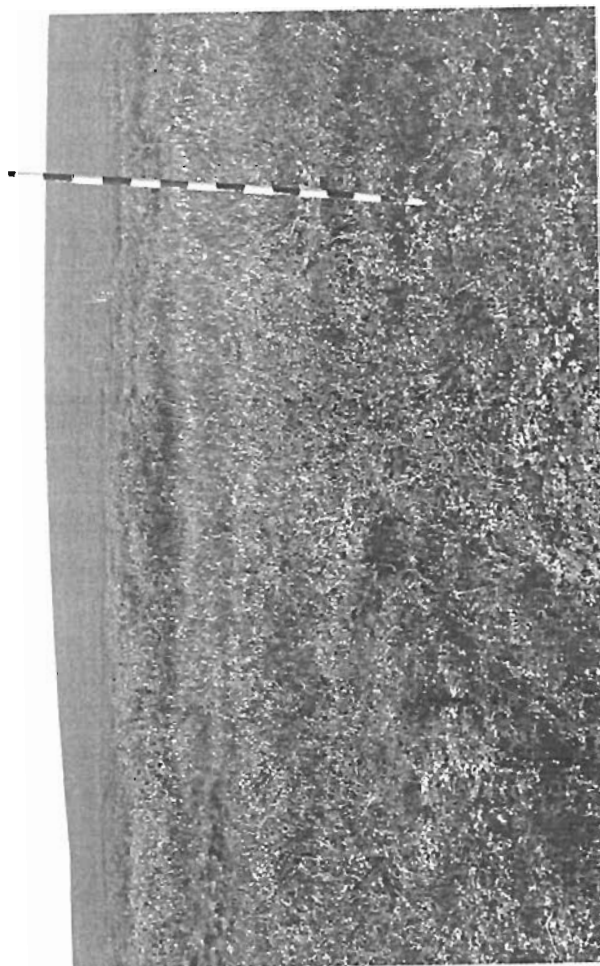
Landscape Relevé HV-32

Soil Profile HV-32

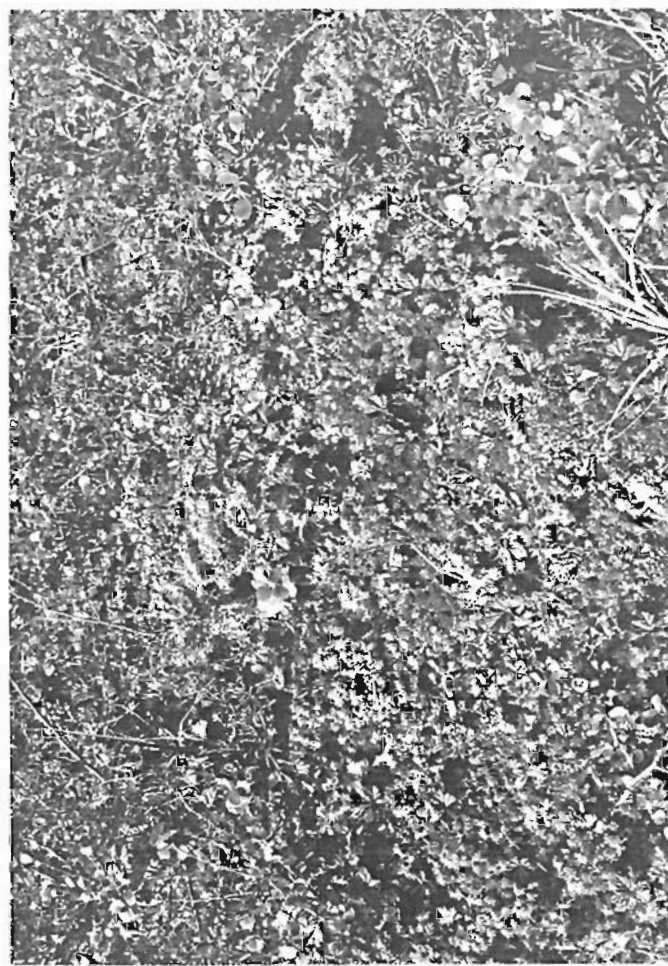




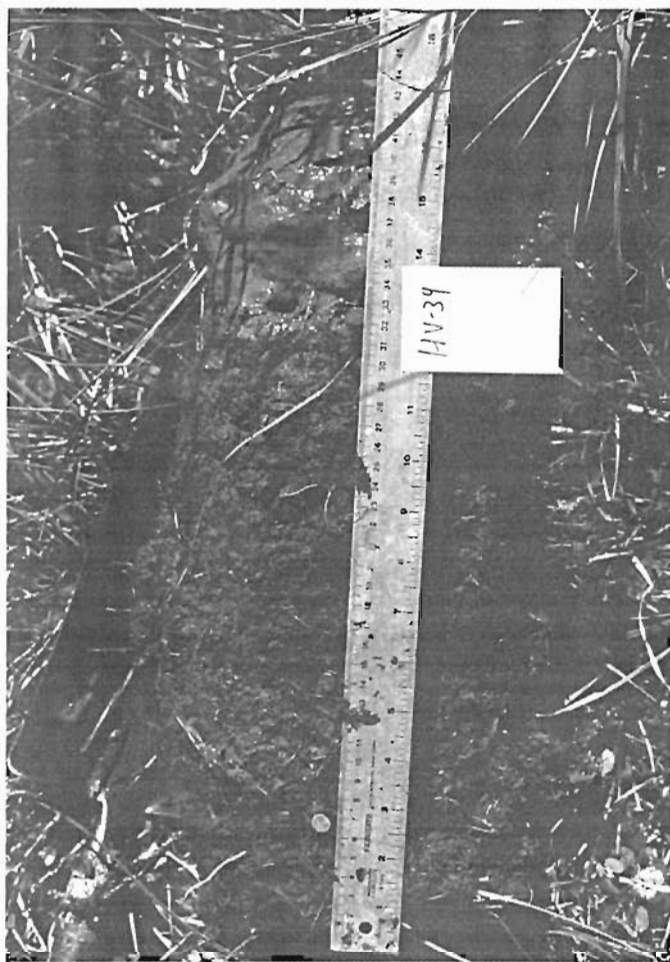
Soil Profile HV-33



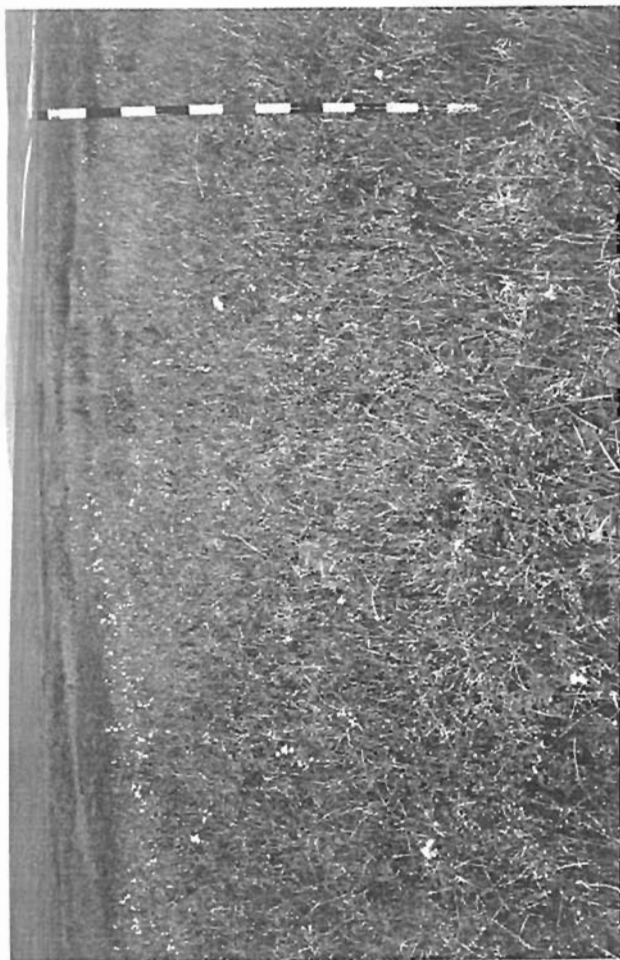
Landscape Relevé HV-33



Close-up Vegetation HV-33



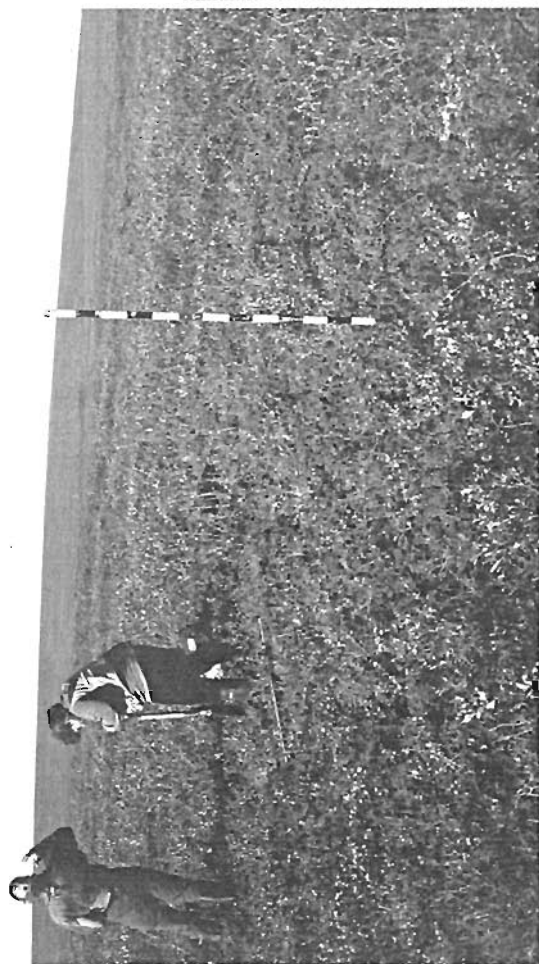
Soil Profile HV-34



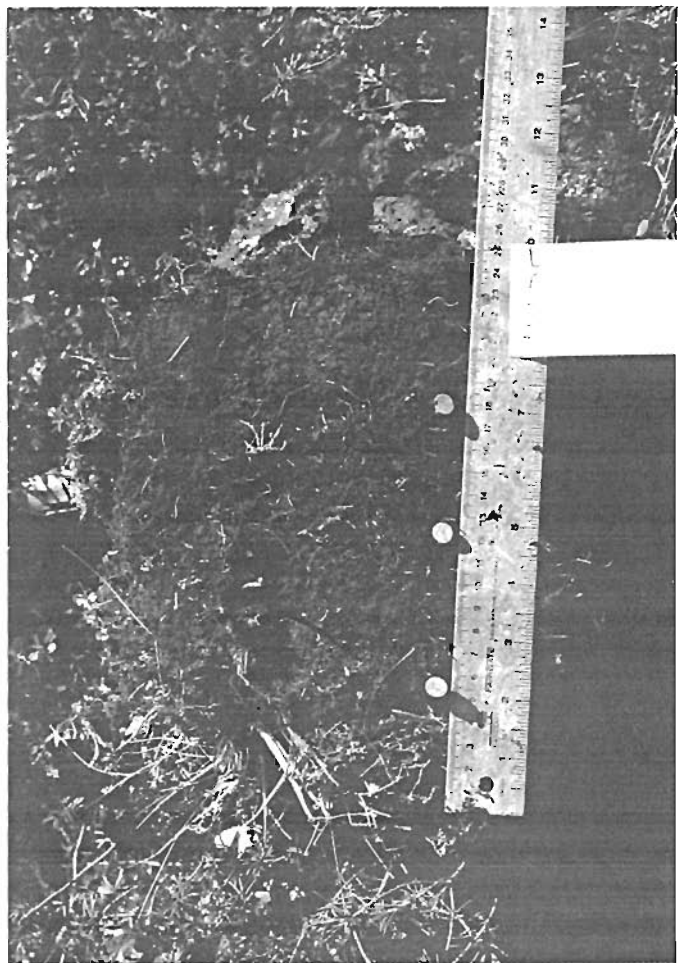
Landscape Relevé HV-34



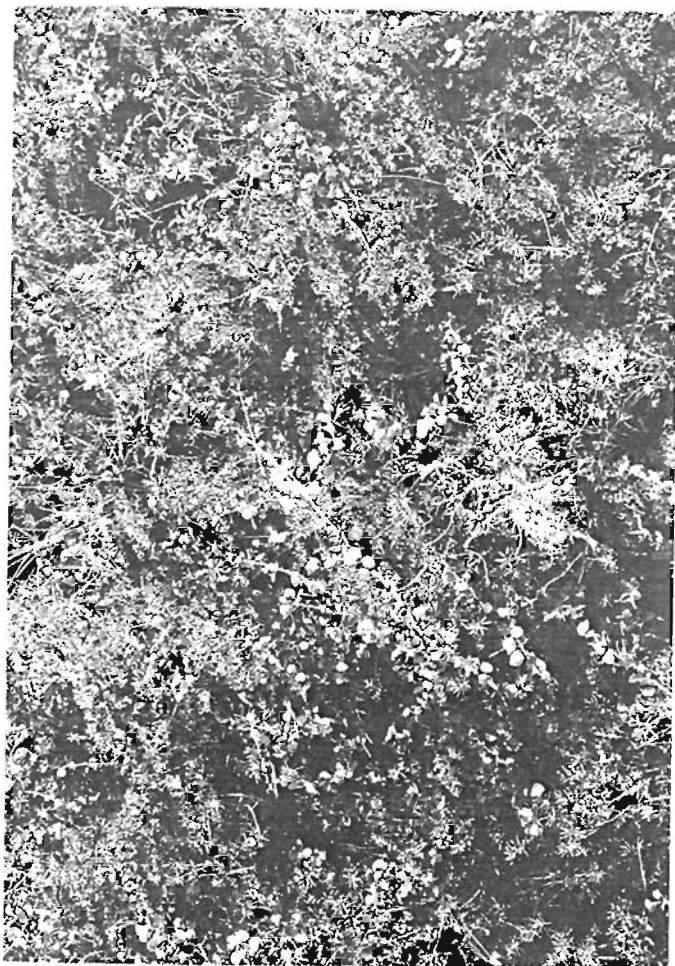
Close-up Vegetation HV-34



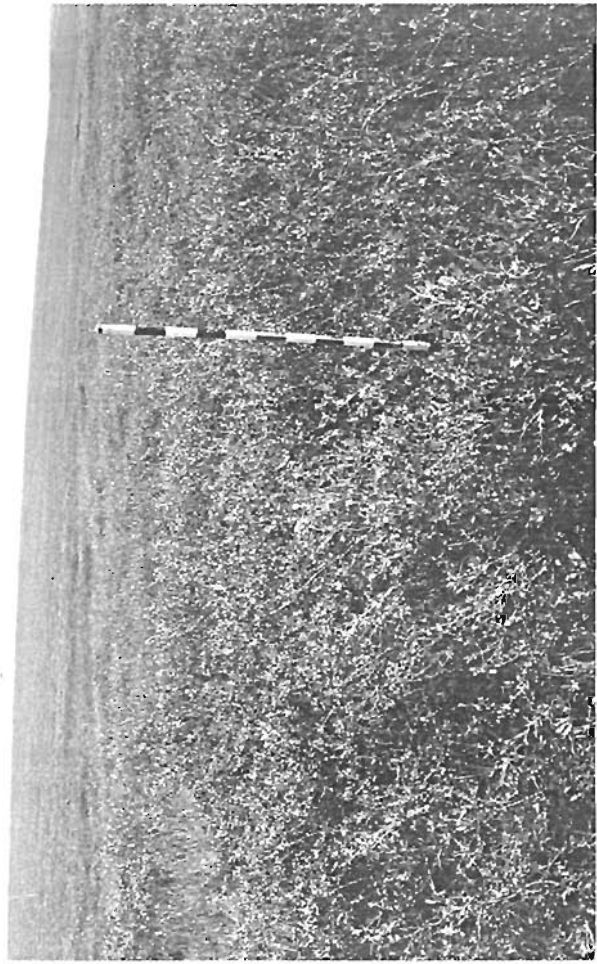
Landscape Relevé HV-35



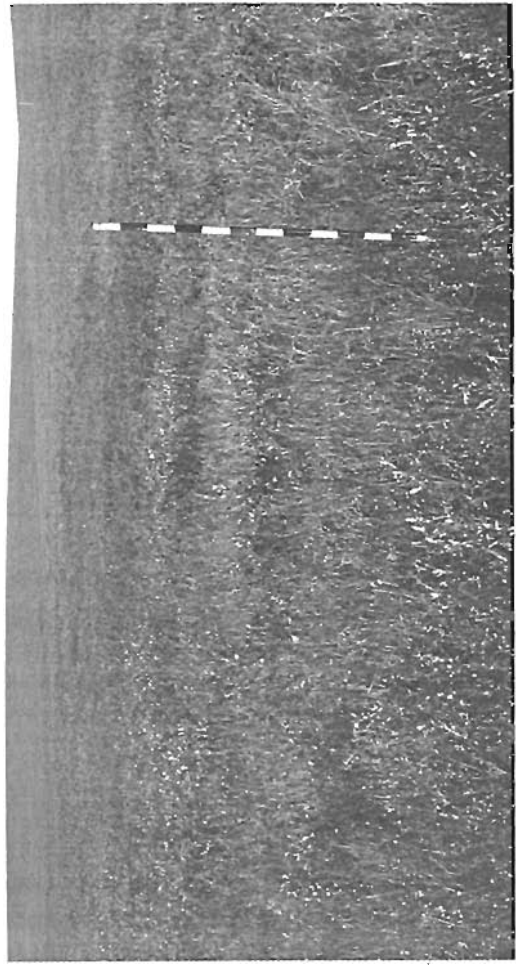
Soil Profile HV-35



Close-up Vegetation HV-35

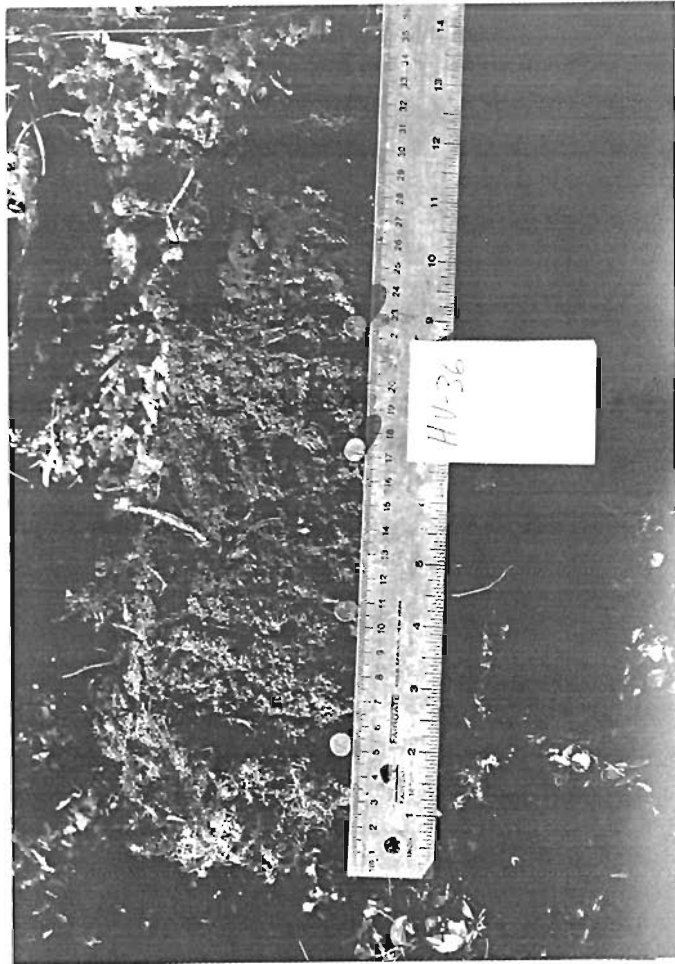


Landscape Relevé HV-36

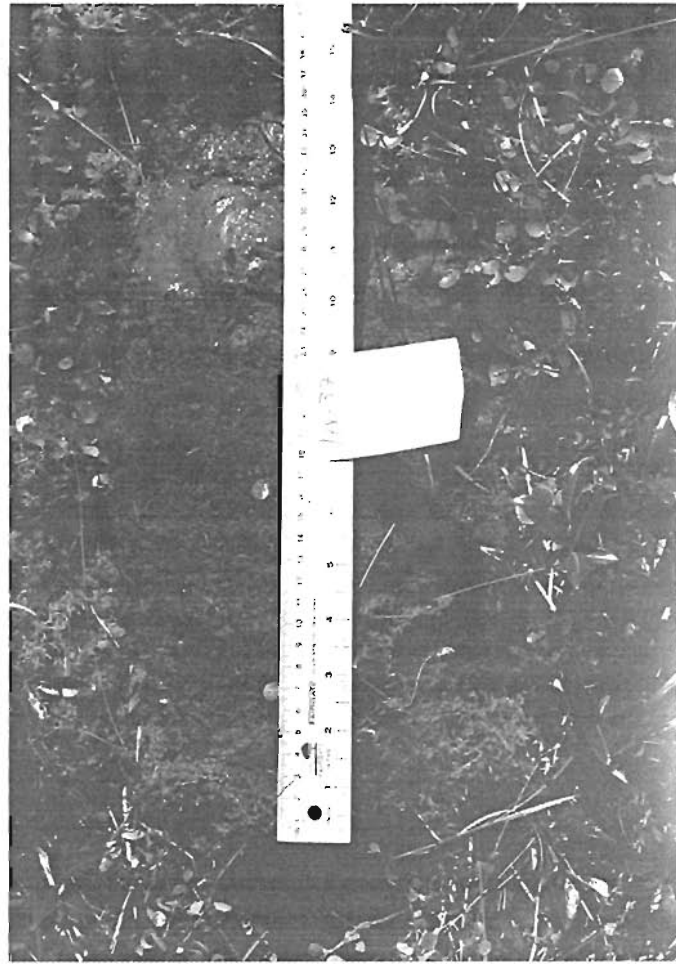


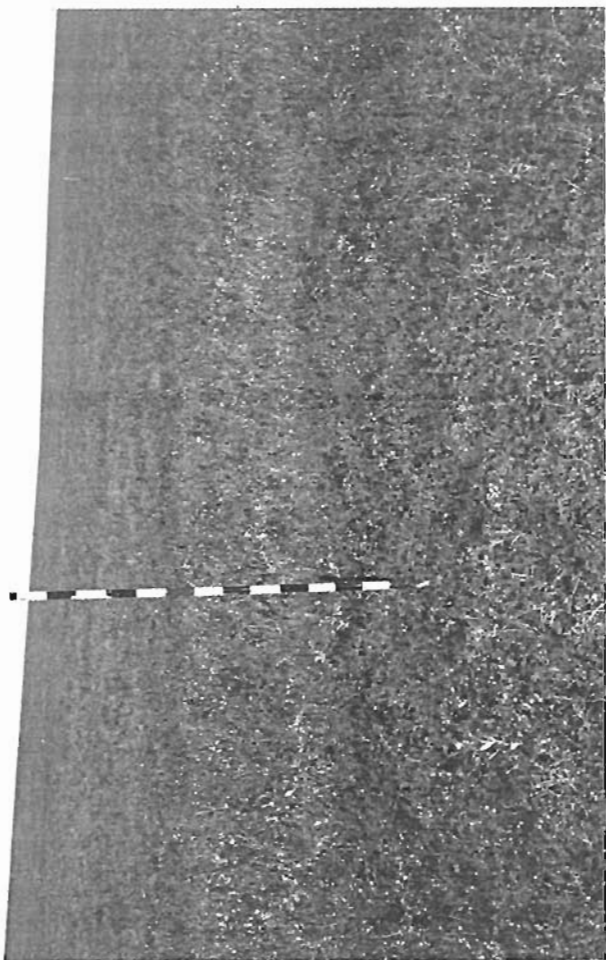
Landscape Relevé HV-37

Soil Profile HV-36

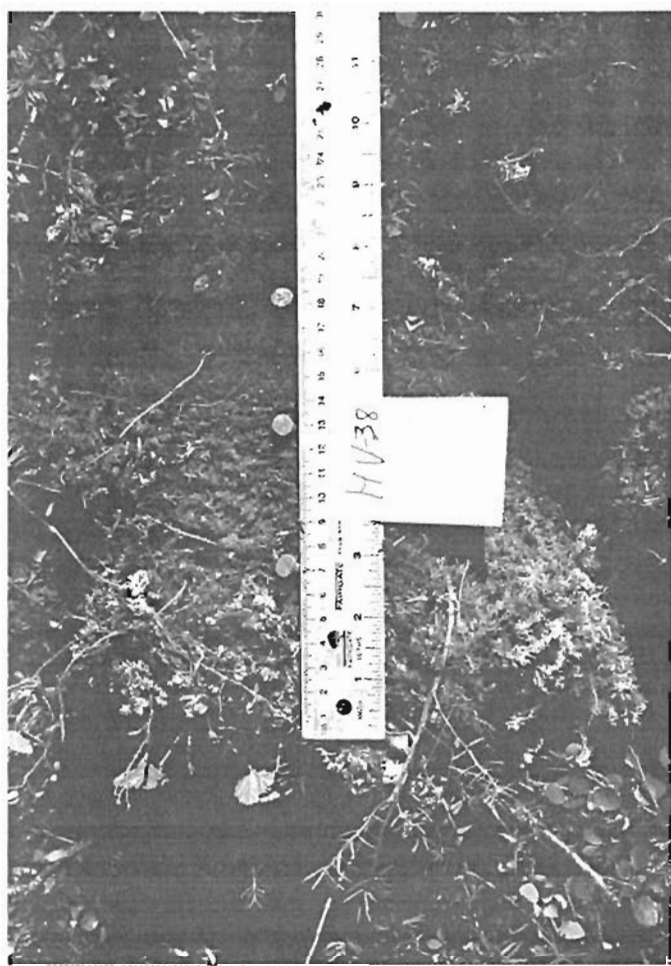


Soil Profile HV-37

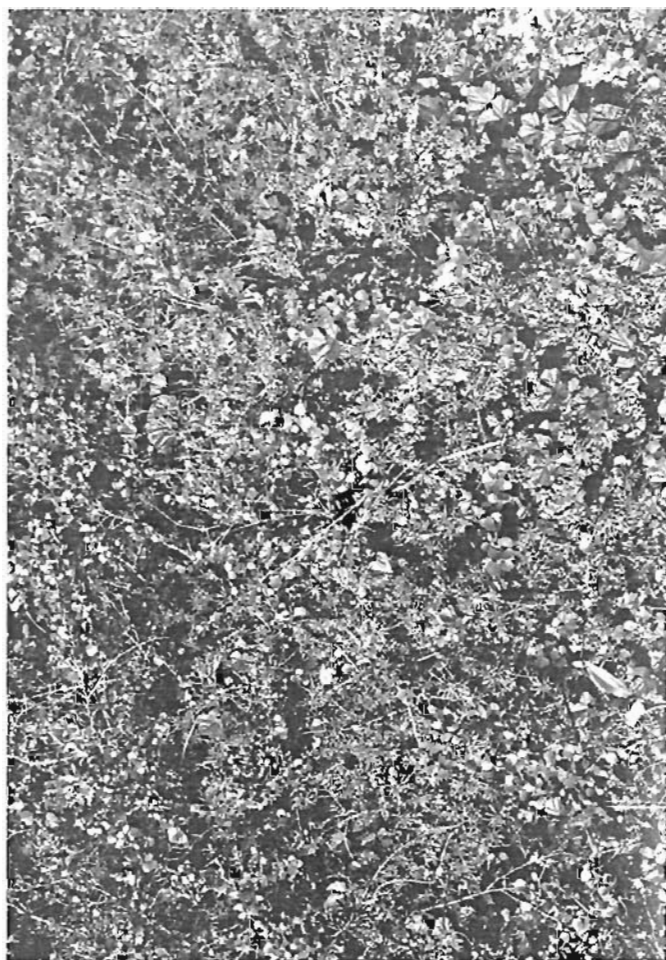




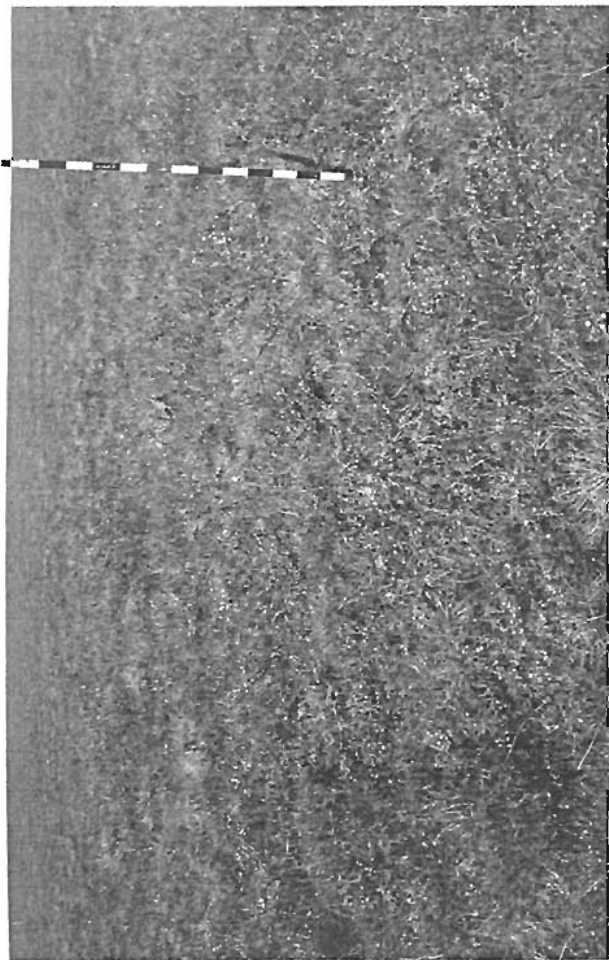
Landscape Relevé HV-38



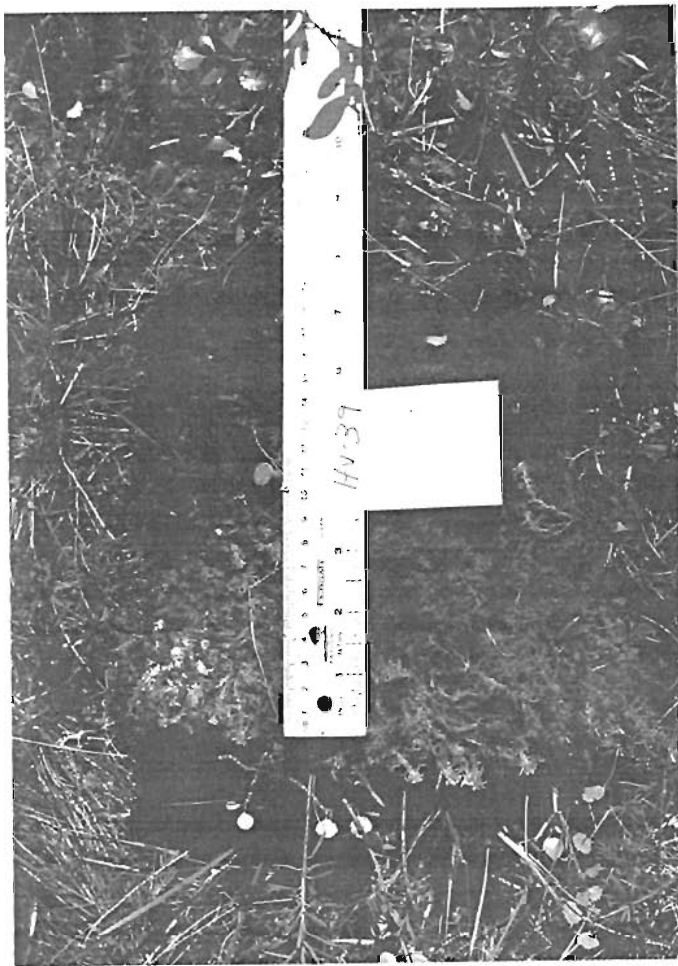
Soil Profile HV-38



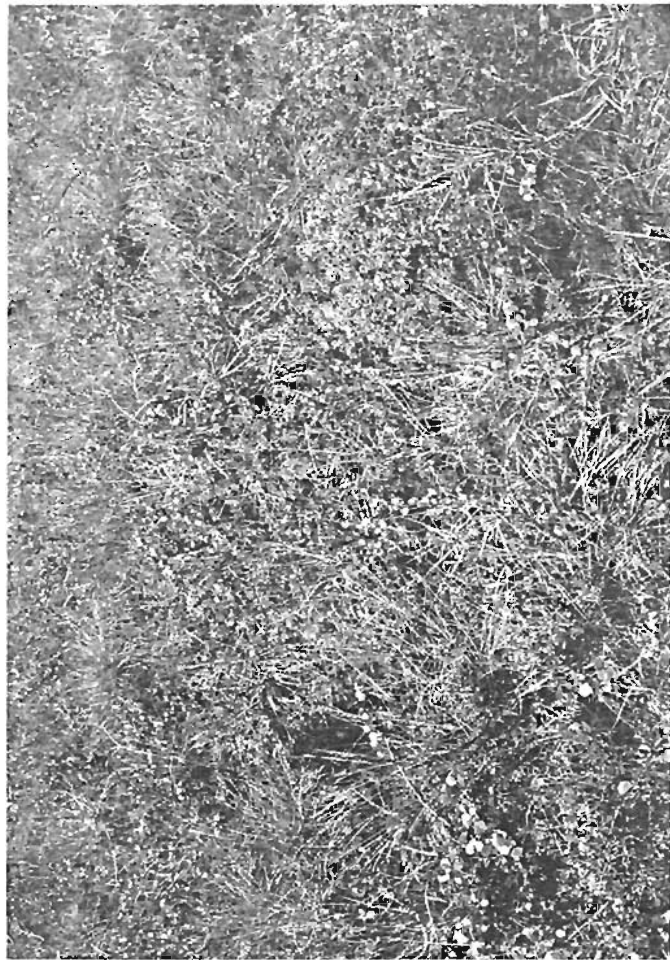
Close-up Vegetation HV-38



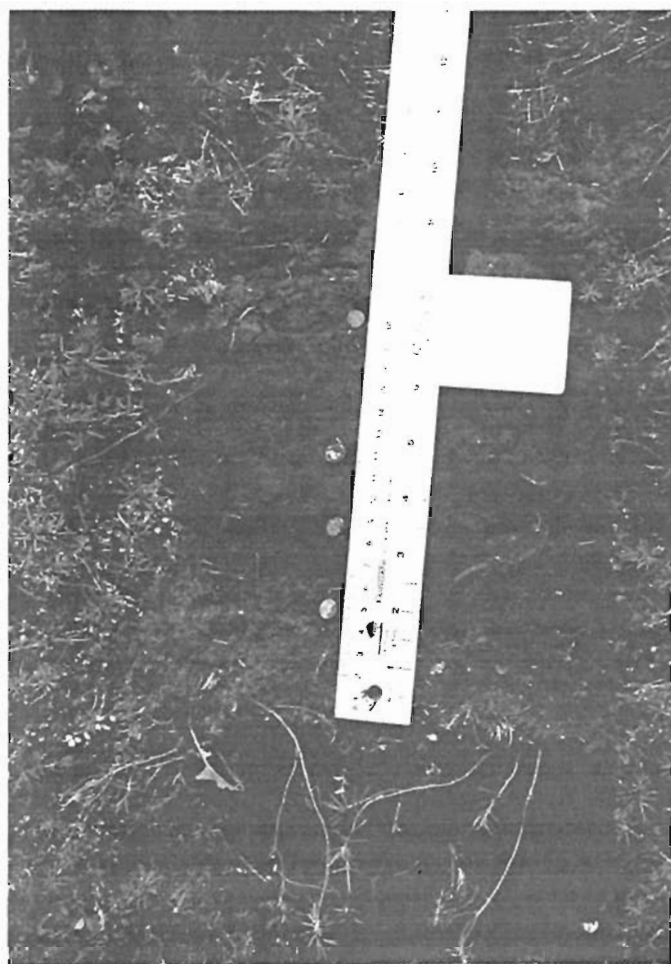
Landscape Relevé HV-39



Soil Profile HV-39



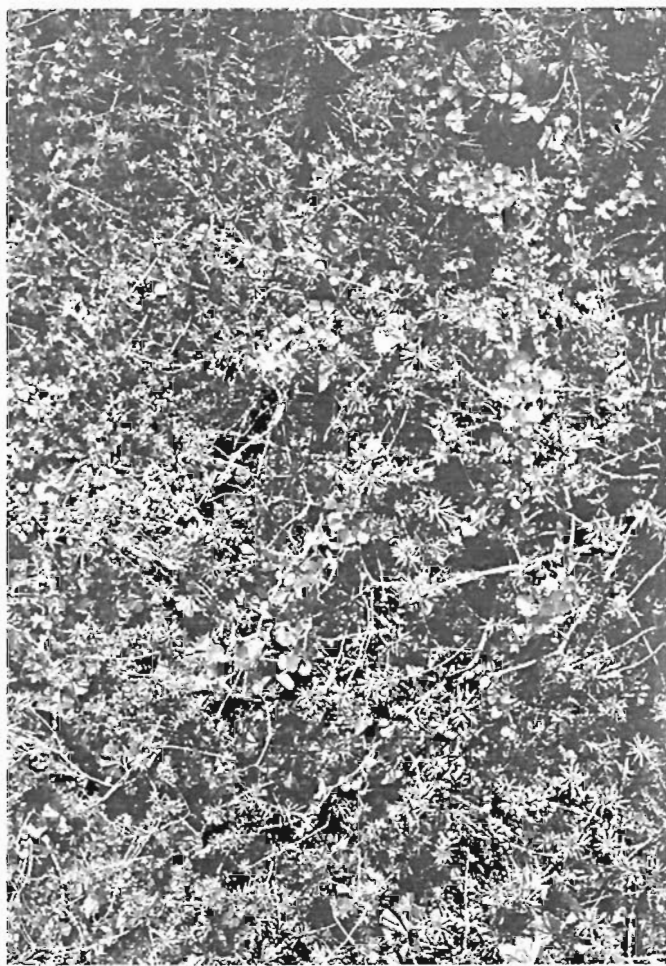
Close-up Vegetation HV-39



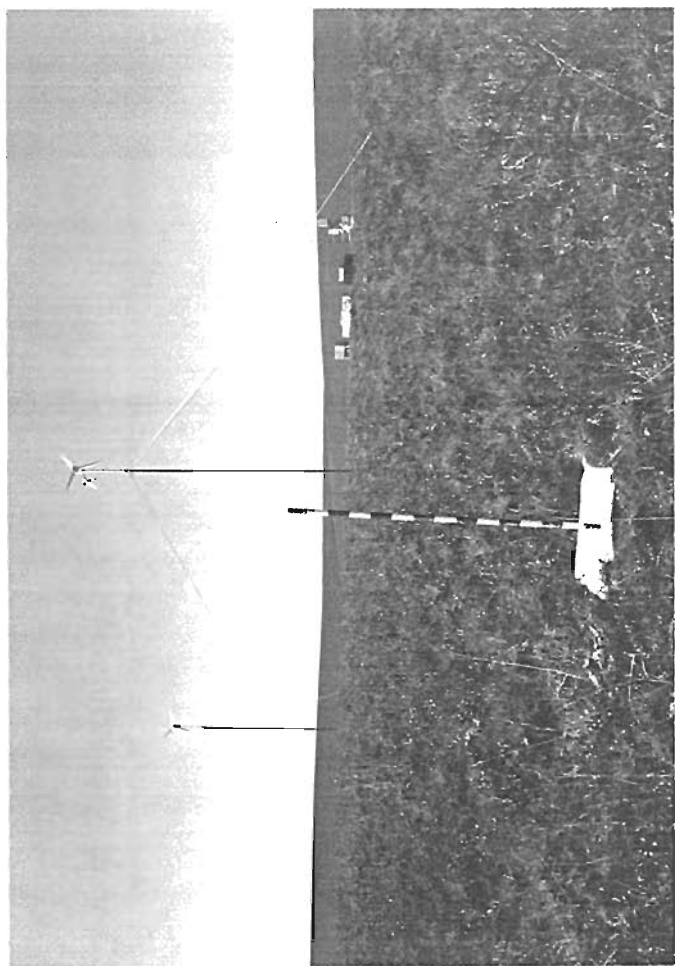
Soil Profile HV-40



Landscape Relevé HV-40

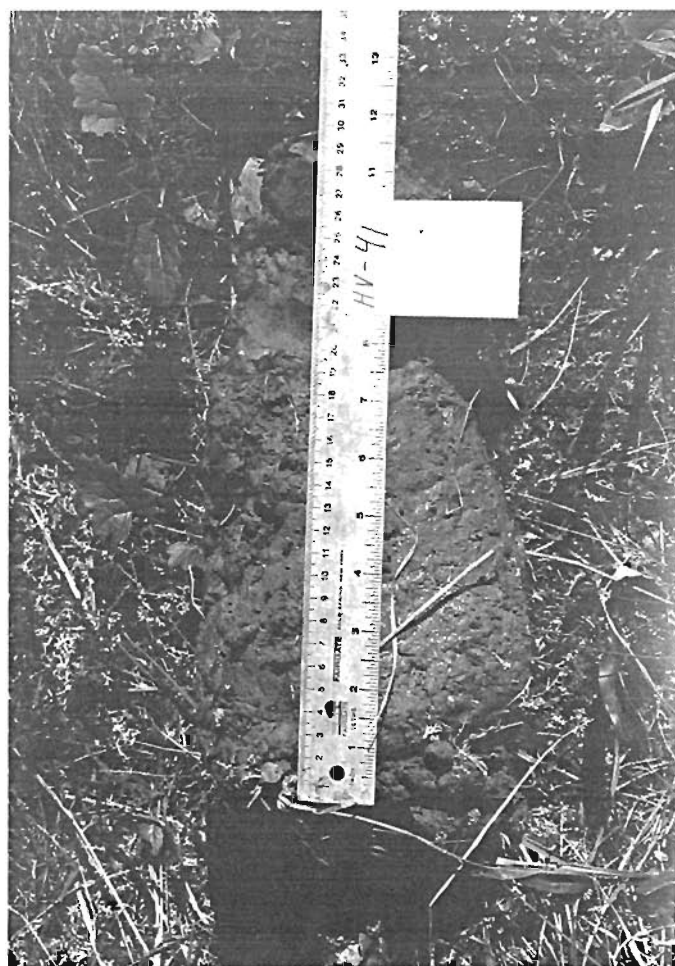


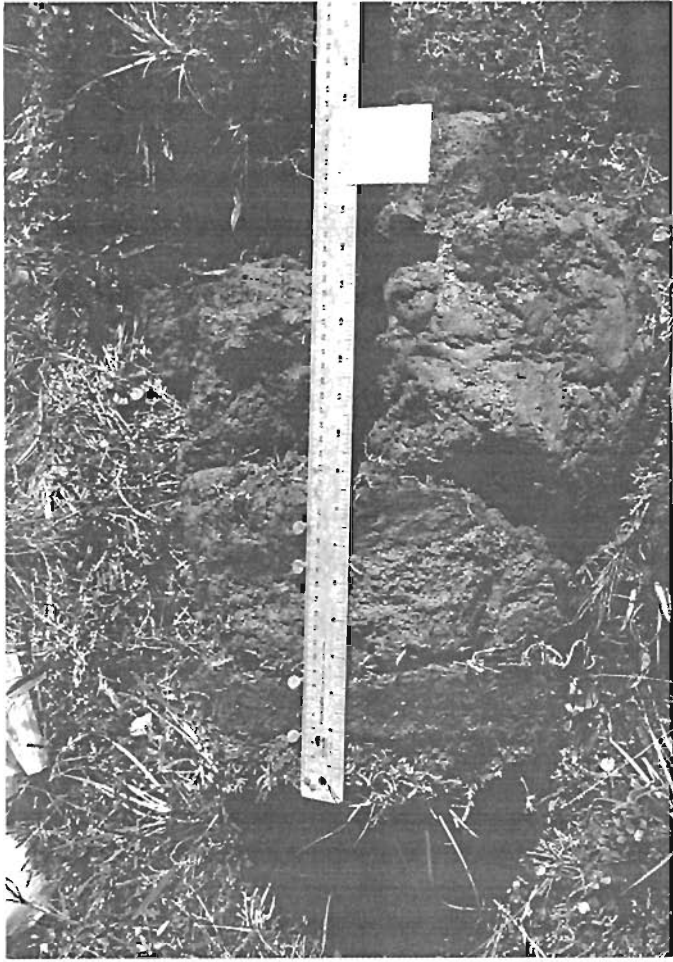
Close-up Vegetation HV-40



Landscape Relevé HV-41

Soil Profile HV-41





Soil Profile HV-42α



Landscape Relevé HV-42

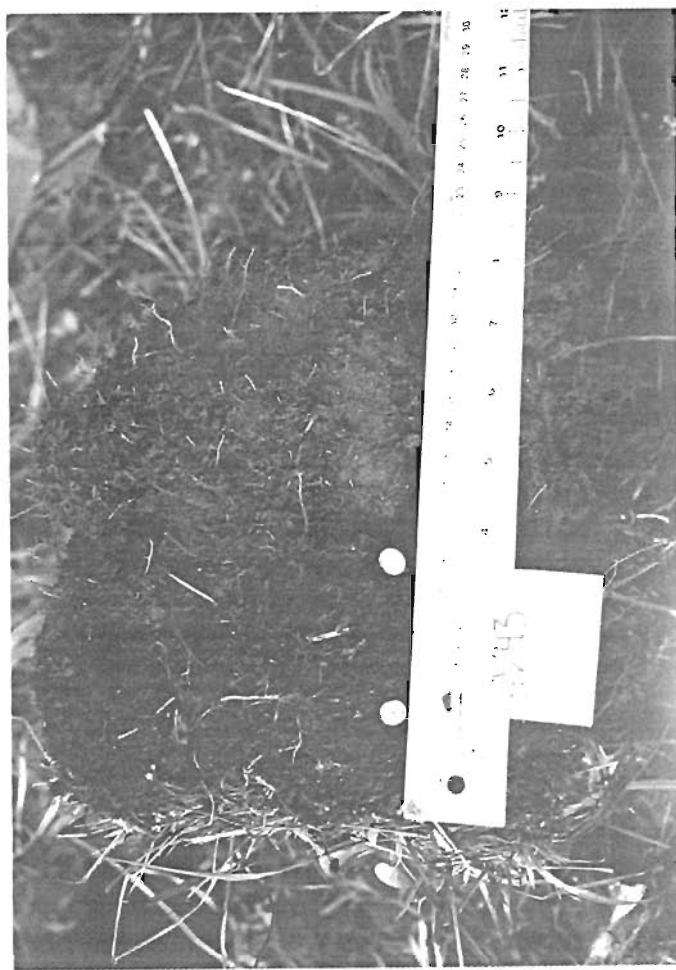


Close-up Vegetation HV-42 α

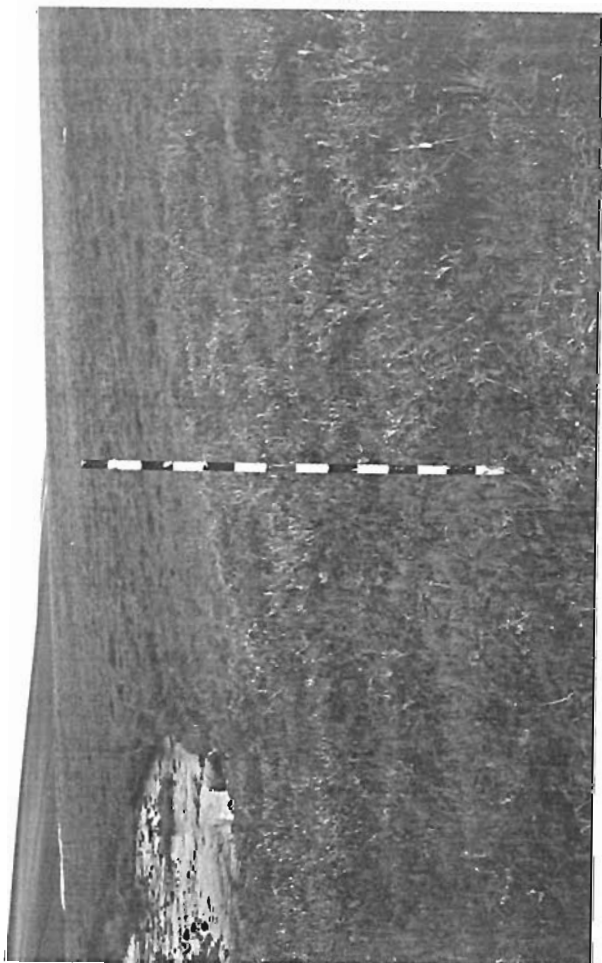


Close-up Vegetation HV-43

Soil Profile HV-43

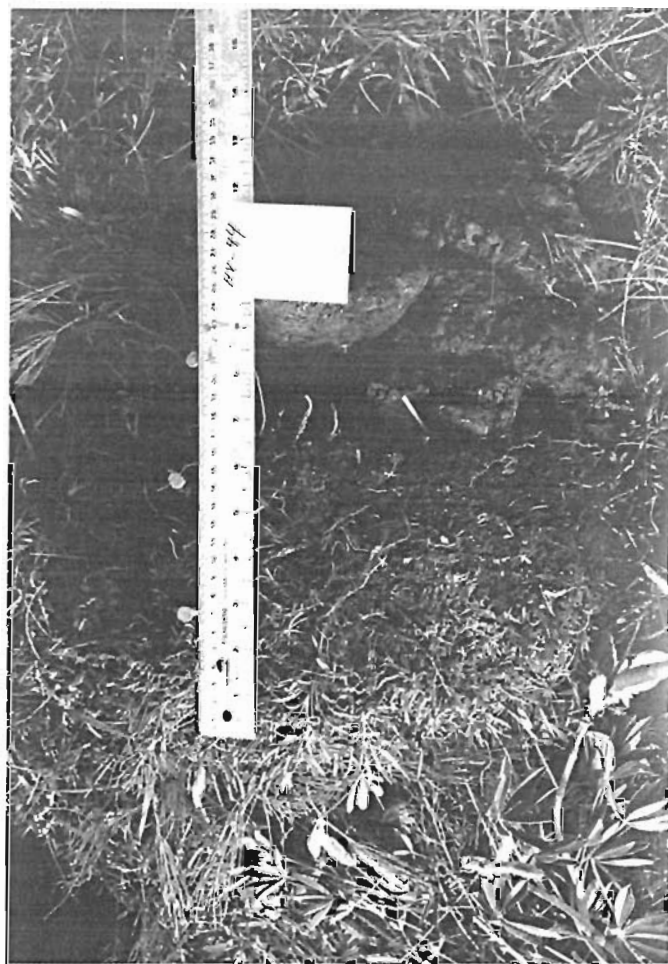


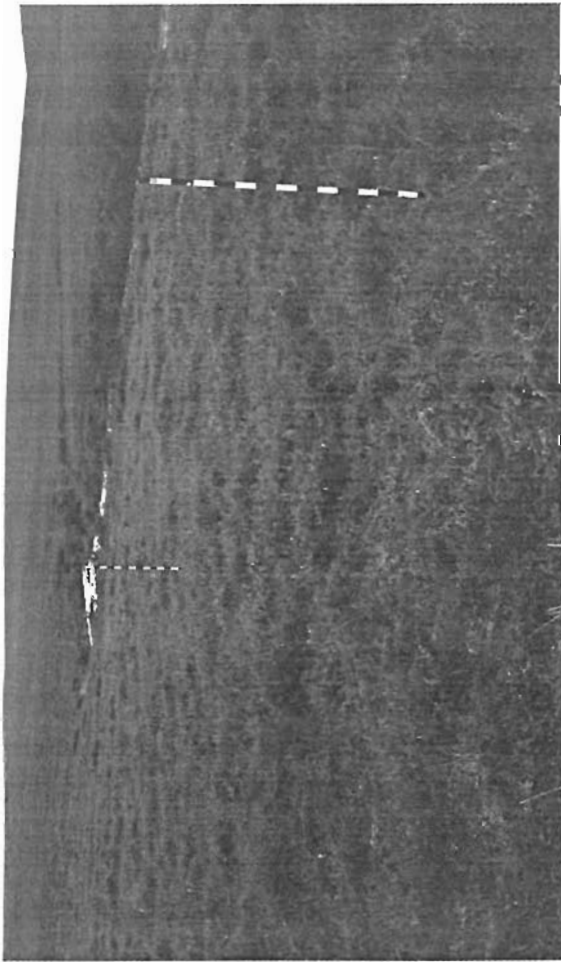
Landscape Relevé HV-43



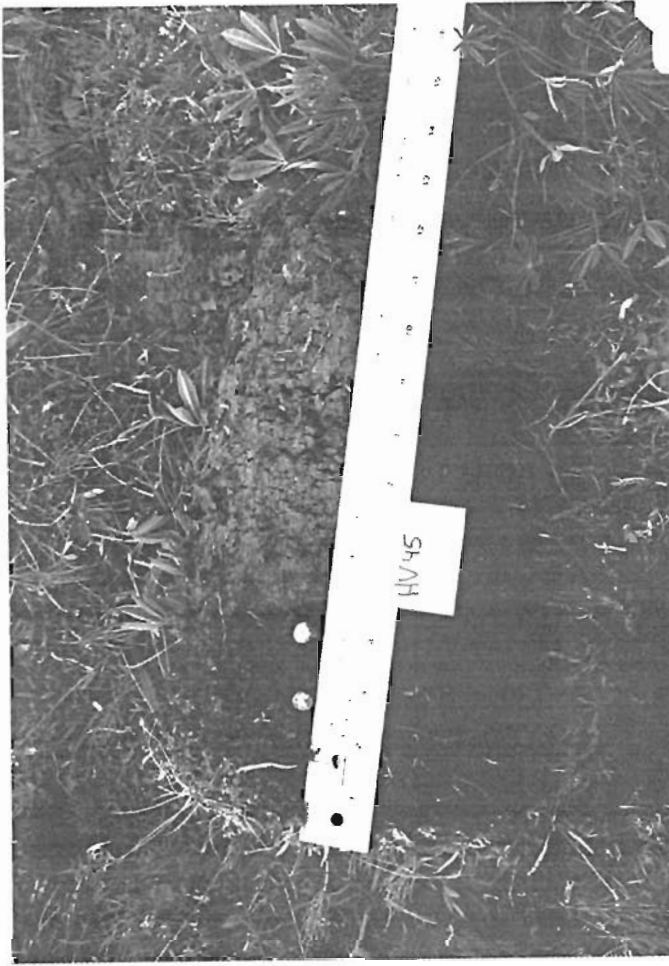
Landscape Relevé HV-44

Soil Profile HV-44

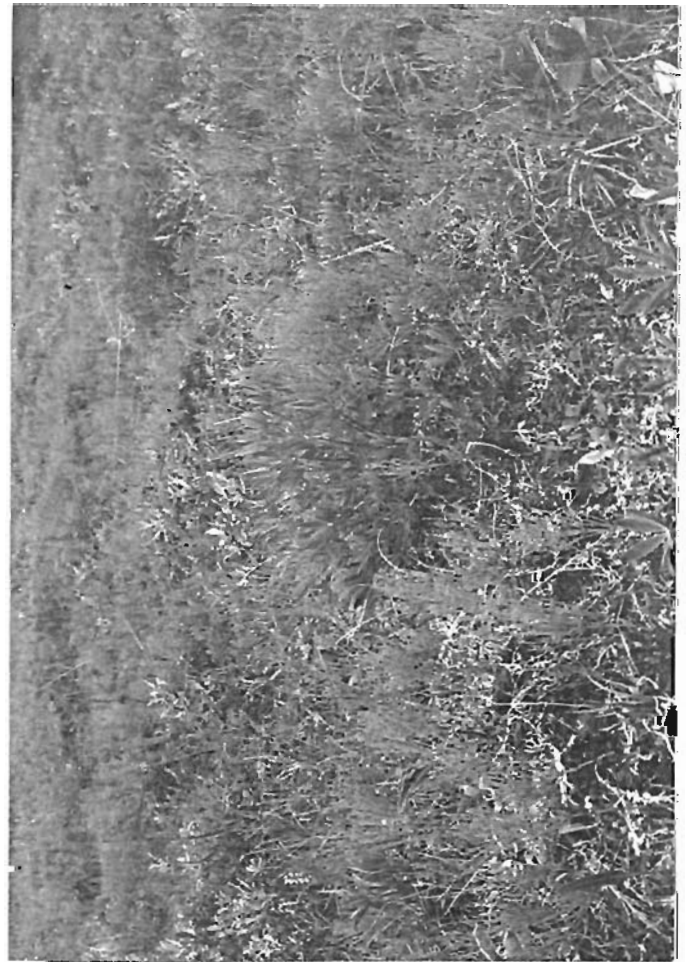




Landscape Relevé HV-45



Soil Profile HV-45

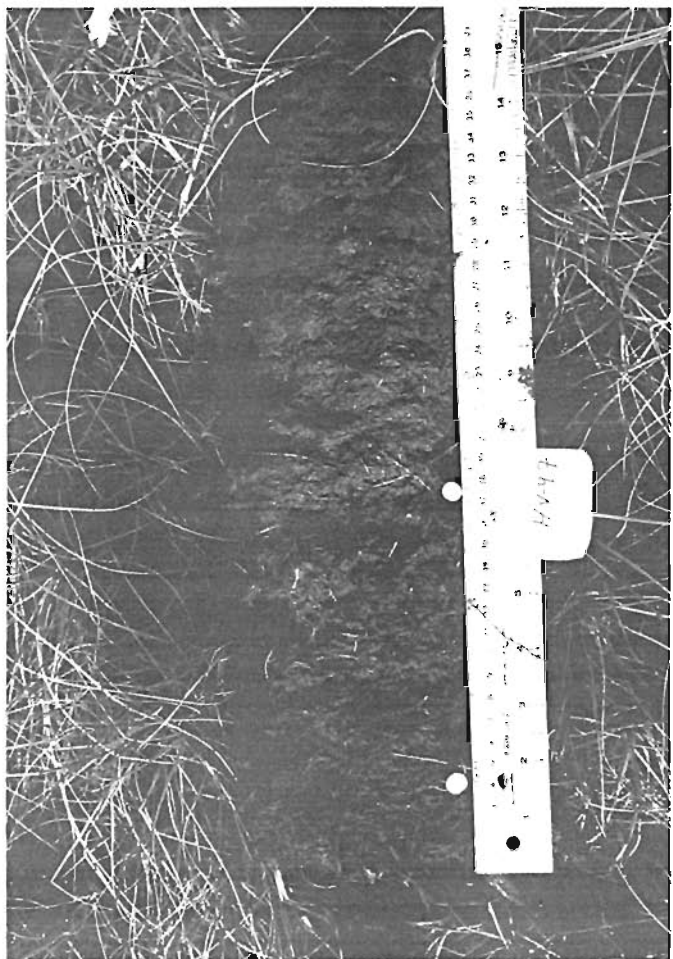
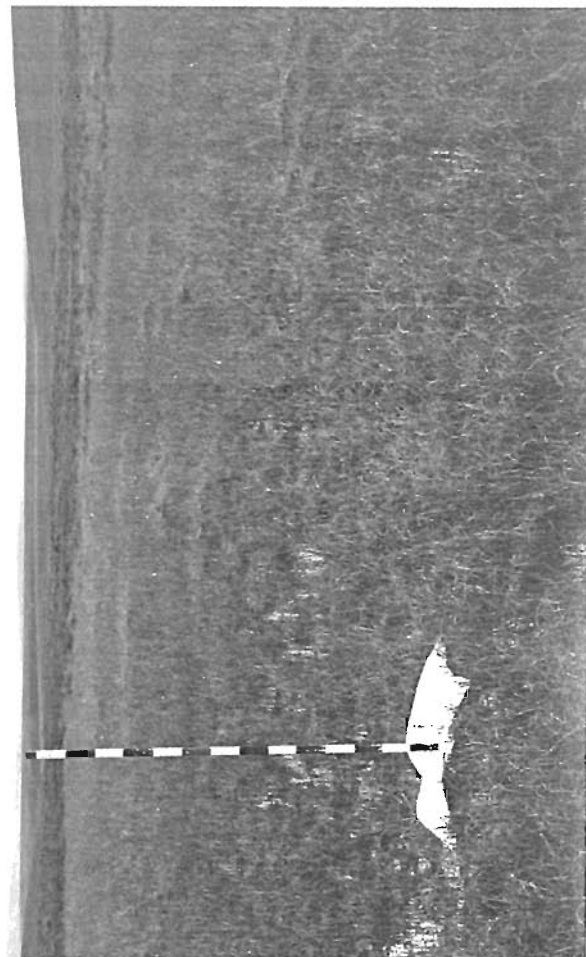


Close-up Vegetation HV-45



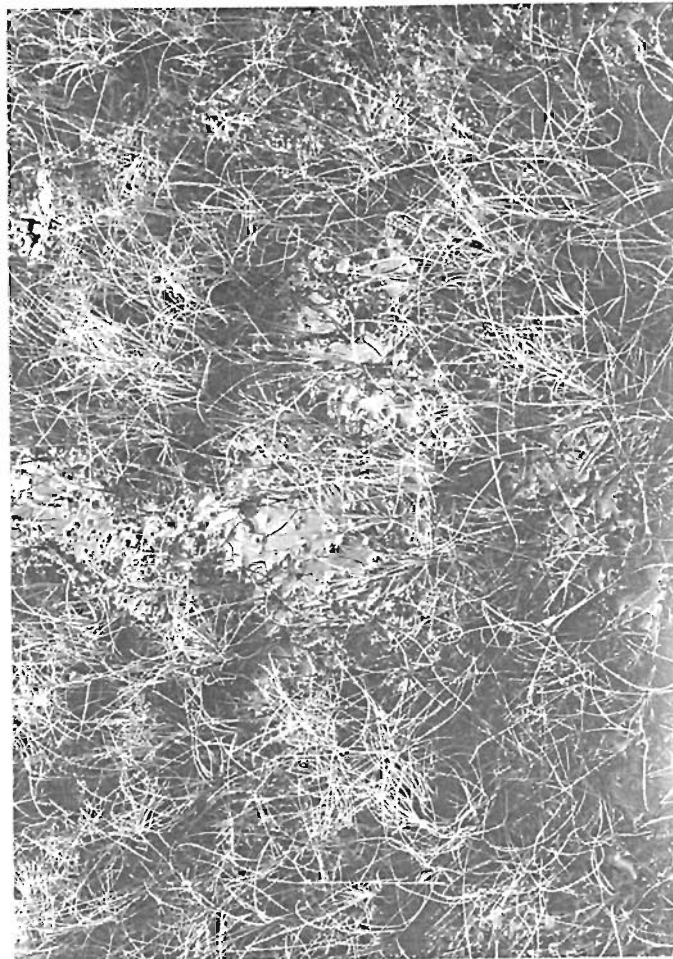
Landscape Relevé HV-46

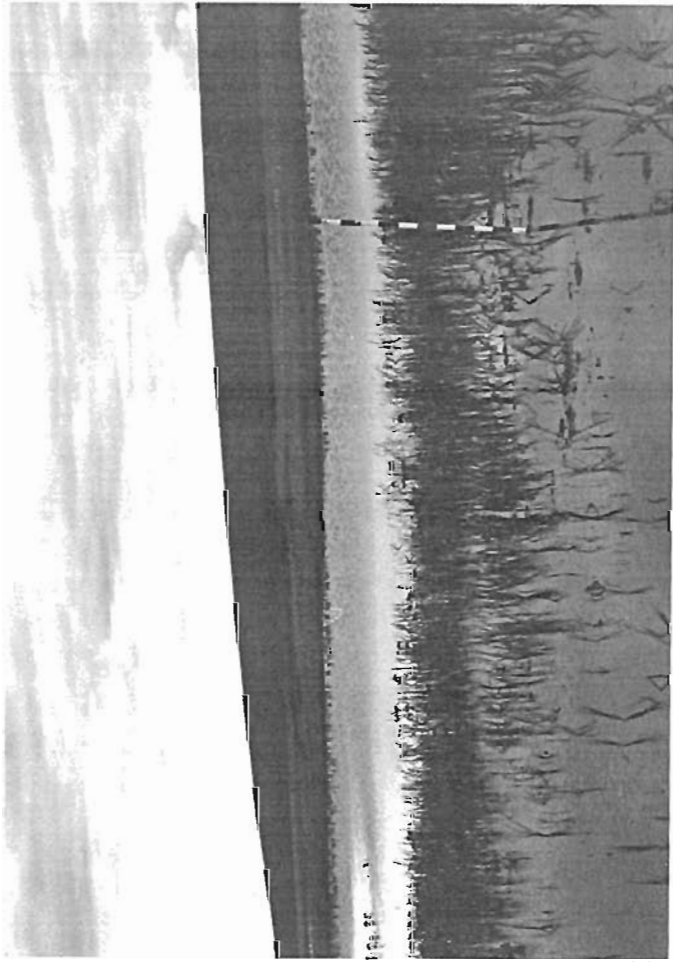
Landscape Relevé HV-47



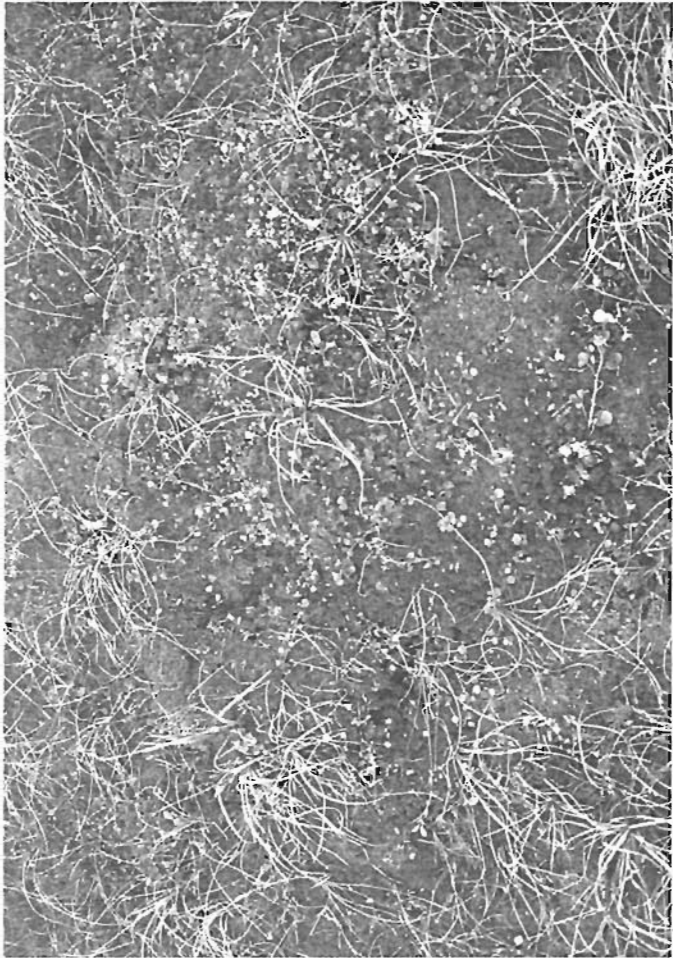
Soil Profile HV-47

Close-up Vegetation HV-47



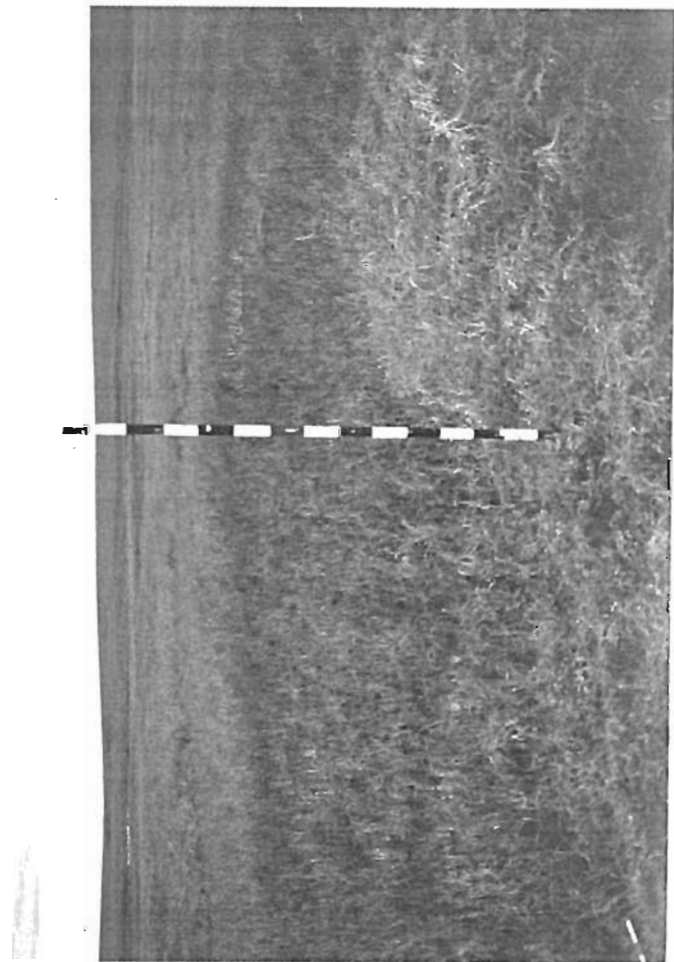


Landscape Relevé HV-48

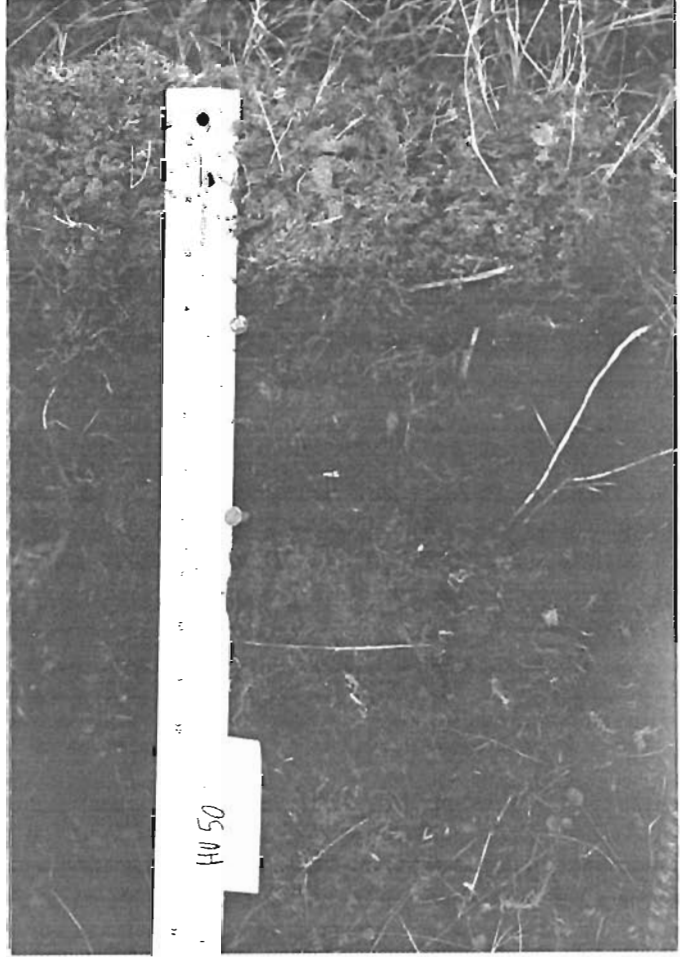


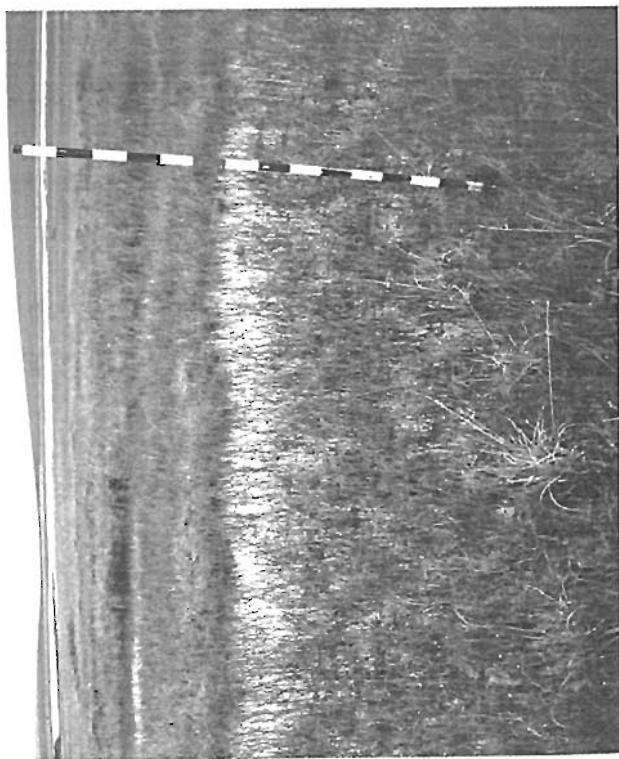
Close-up Vegetation HV-50

Landscape Relevé HV-50



Soil Profile HV-50

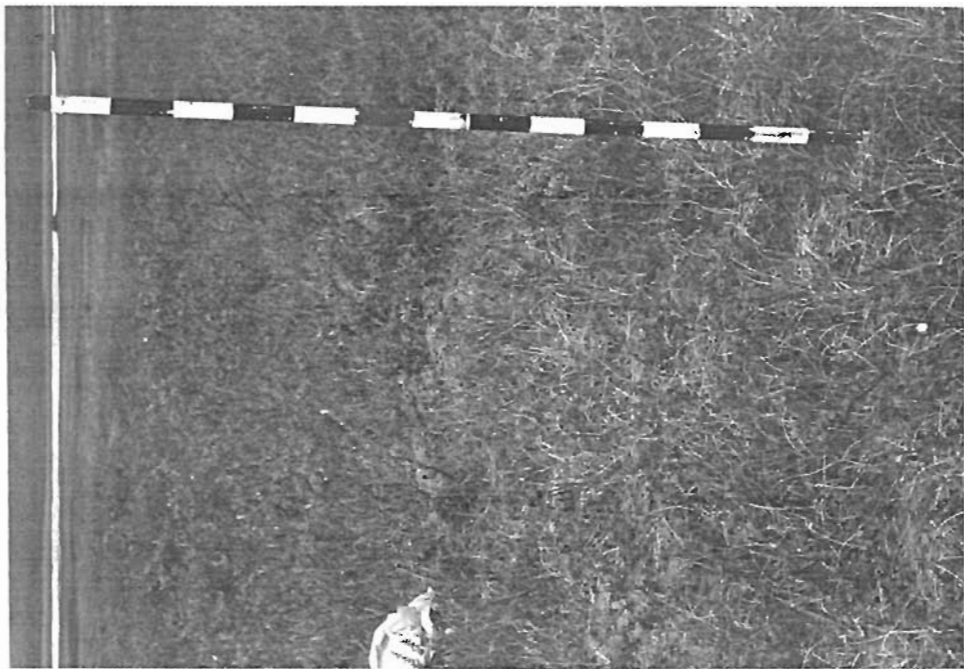




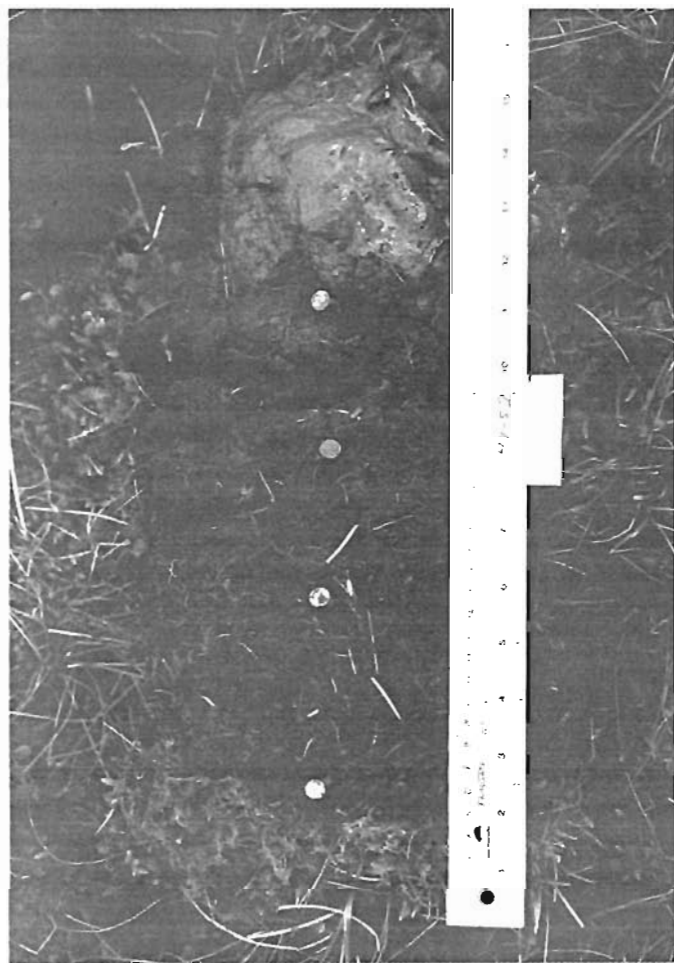
Landscape Relevé HV-51

Close-up Vegetation HV-51

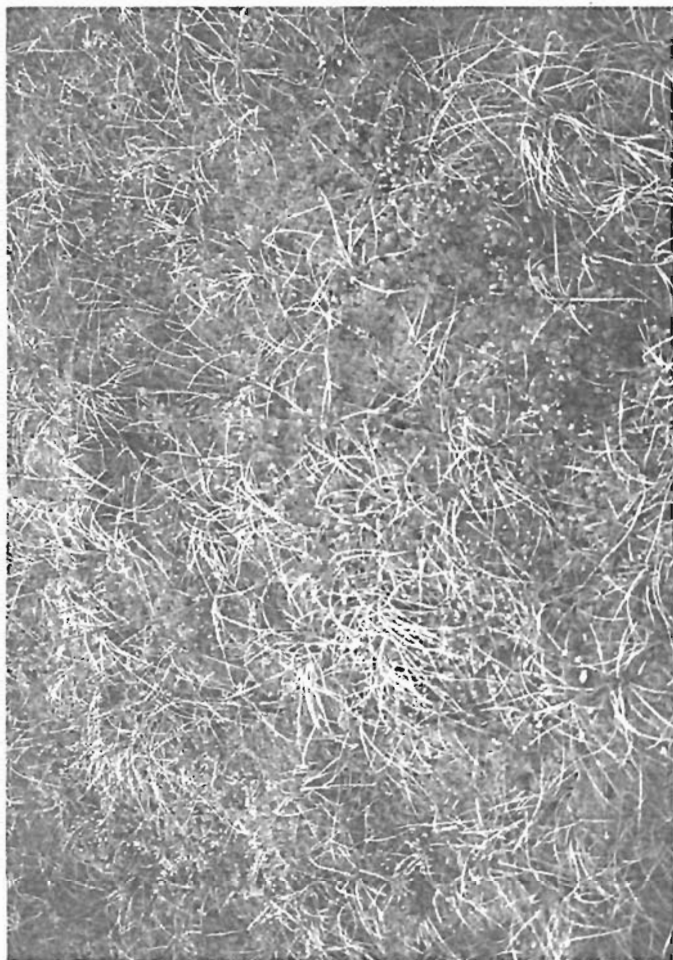




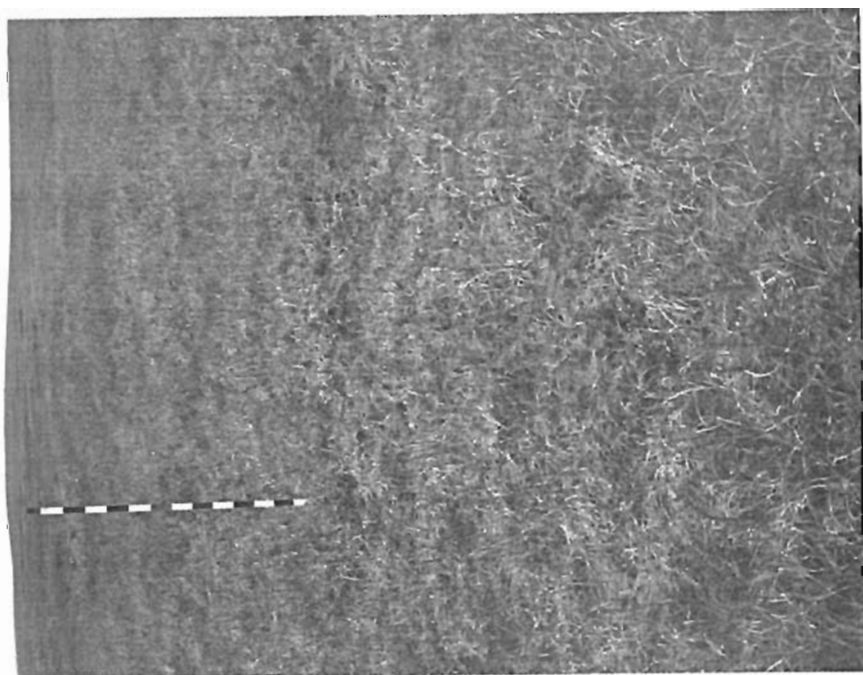
Landscape Relevé HV-52



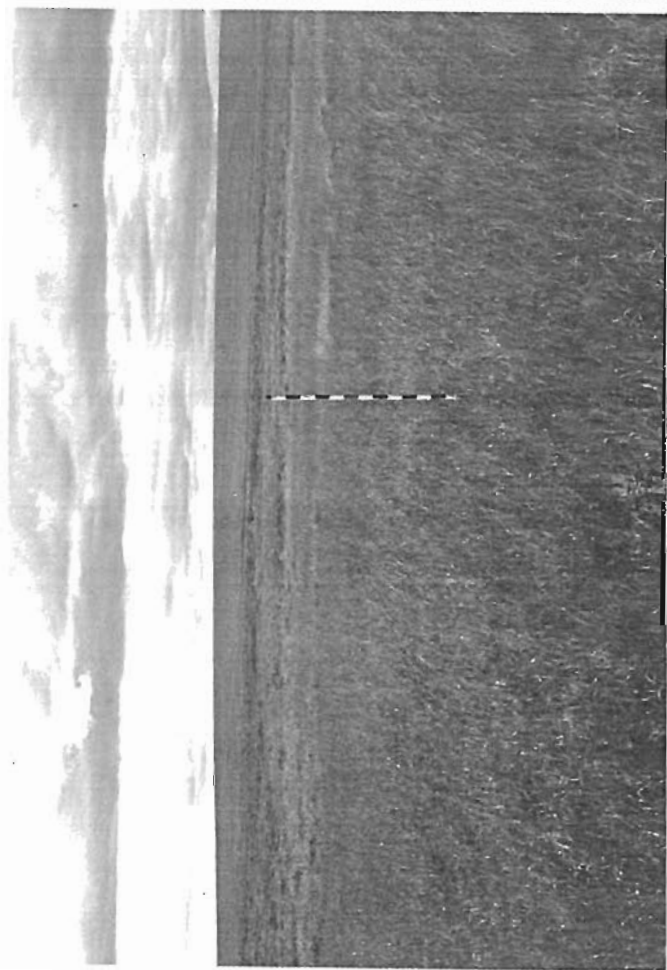
Soil Profile HV-52



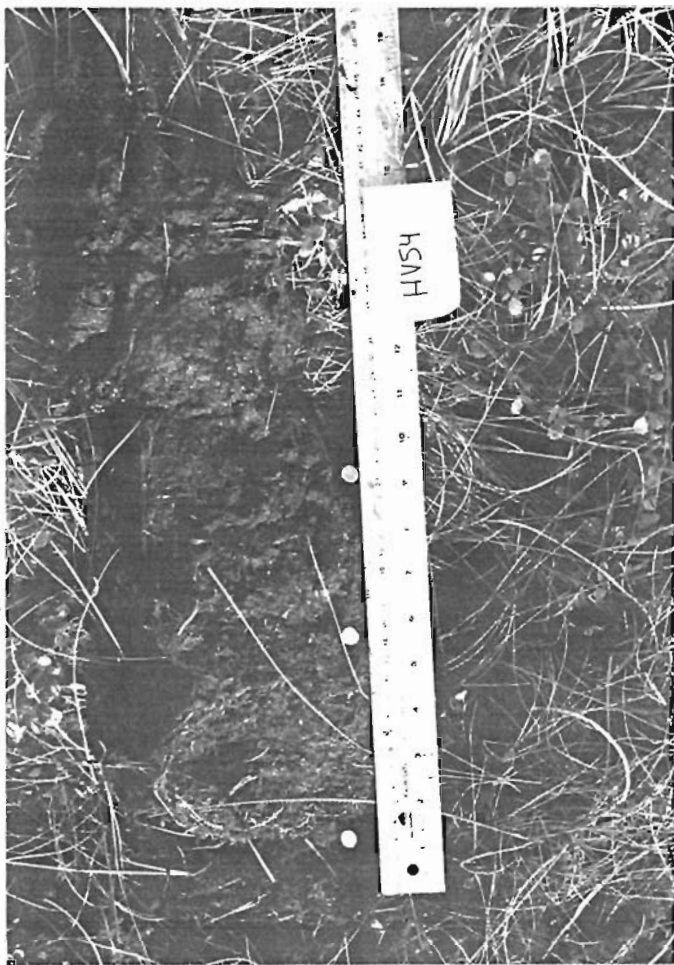
Close-up Vegetation HV-53



Landscape Relevé HV-53



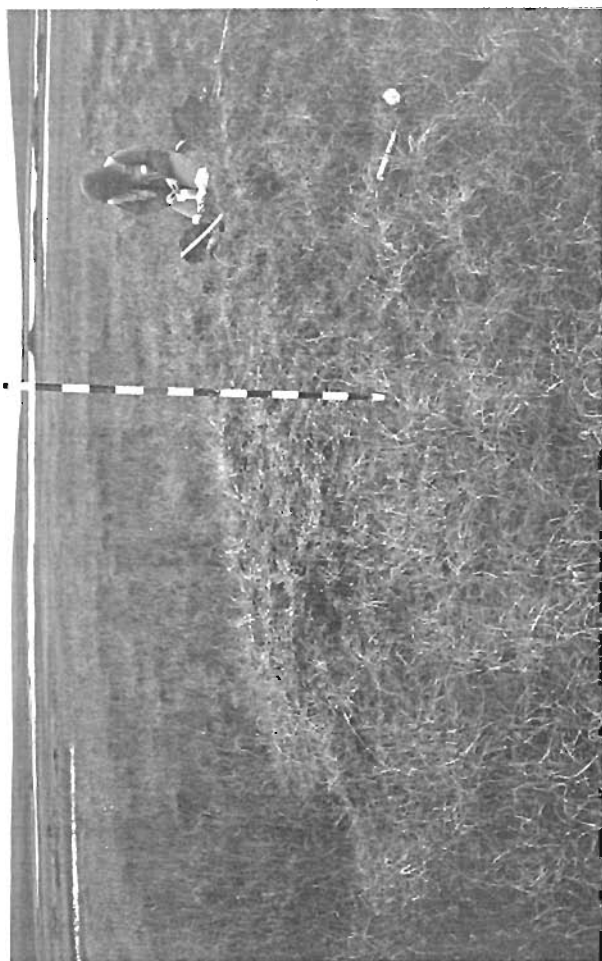
Landscape Relevé HV-54



Soil Profile HV-54



Close-up Vegetation HV-54



Landscape Relevé HV-55

Soil Profile HV-55

