



Natural Environment of The Fox-C Dew Line Site

Ekalugad Fjord

Baffin Island

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Government Works Canada
Western Region**



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**NATURAL ENVIRONMENT OF THE
FOX-C DEW LINE SITE, EKALUGAD FJORD, BAFFIN ISLAND**

SUBMITTED TO

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TABLE OF CONTENTS

<u>PROPRIETARY RESTRICTION NOTICE</u>	1
<u>INTRODUCTION</u>	3
<u>NATURAL ENVIRONMENT</u>	4
<u>1. AQUATIC HABITAT</u>	4
<u>1.1 ARCTIC CHARR BIOLOGY</u>	5
<u>1.2 BREEDING</u>	5
<u>1.3 IN-WATER WORKS</u>	5
<u>2. FLORA</u>	7
<u>3. FAUNA</u>	9
<u>3.1 BIRDS</u>	9
<u>3.2 MAMMALS</u>	9
<u>3.3 ARTHROPODS</u>	10
<u>4. SPECIES AT RISK</u>	11
<u>4.1 PEREGRINE FALCON, TUNDRIUS SUBSPECIES</u>	11
<u>4.2 WOLVERINE, WESTERN POPULATION</u>	11
<u>4.3 POLAR BEAR</u>	12
<u>5. RECOMMENDATIONS FOR THE ECOLOGICAL RISK ASSESSMENT (ERA)</u>	13
<u>CLOSURE</u>	14
<u>REFERENCES</u>	15

FIGURE

FIGURE 1 FOX-C DEW LINE SITE

LIST OF TABLES

<u>TABLE 1</u>	<u>DOCUMENTED FLORA OF FOX-C</u>	8
<u>TABLE 2</u>	<u>DOCUMENTED BIRD SPECIES AT FOX-C</u>	9
<u>TABLE 3</u>	<u>DOCUMENTED MAMMALS AT FOX-C</u>	10
<u>TABLE 4</u>	<u>DOCUMENTED ARTHROPODS AT FOX-C</u>	10
<u>TABLE 5</u>	<u>RECOMMENDED SPECIES FOR THE ECOLOGICAL RISK ASSESSMENT</u>	13

APPENDIX

APPENDIX 1 PHOTOGRAPHIC RECORD

INTRODUCTION



Aerial View of Ekalugad Fjord.



Aerial view of the freshwater lake and outflow.



Aerial view of the outflow into Qarmaralik Cove.

In August 2004, Jacques Whitford Limited was retained by Public Works and Government Services Canada (PWGSC) on behalf of the Department of Indian Northern Affairs and Northern Development (DIAND) to describe fish habitat and the natural environment at the Fox C DEW line site located on the Ekalugad Fjord, Baffin Island, approximately 195 kilometers south of the Clyde River. In addition, recommendations for species that should be included in the Ecological Risk Assessment of the Fox-C DEW line site are included in this report. The upper or main station area of Fox-C overlooks the Ekalugad Fjord at 770 meters above sea level, and is connected to the lower site, namely Qarmaralik Cove (former beaching area) and the freshwater lake by gravel roads that are in disrepair. Figure 1 provides a layout Fox-C (as supplied by PWGSC), indicating the Upper and Lower Site areas as described above.

The Ekalugad Fjord is situated in the Arctic Cordillera ecozone characterized by rugged and partially ice covered mountainous terrain. At Fox-C, the landscape is composed mainly of Precambrian bedrock hills with lowland plains covered with extensive glacial moraine and sand outwash. At the lower site, a glacier fed freshwater lake is situated north west of the main station area. The lake is connected to Qarmaralik Cove in the Arctic Ocean via a one kilometer stretch of meandering river. Substrates at the lower site are a mix of sand, gravel and cobble characteristic of glacial moraines and associated drainage basins. A photographic record taken during field investigations is provided in Appendix 1.



View of Fox-C Upper Site.



Tributary to freshwater lake showing extensive sand and gravel washout.



View of Fox-C glacier and moraines adjacent to lakeshore.

NATURAL ENVIRONMENT

This report has been prepared in order to characterize the natural environment at Fox-C to assist with the development of the Ecological Risk Assessment (ERA) at the Ekalugad Fjord. The lower areas of Fox – C were visited on August 26 and 27 2004, to determine the extent of fish habitat in the freshwater lake, Qarmaralik Cove and the river connecting these two water bodies. In addition, information on plant and animal life was gathered at the upper and lower site during the field investigation.

1. AQUATIC HABITAT

The freshwater lake is approximately 40 hectares in size and is surrounded on three sides by large bedrock hills. Several glacial fed tributaries provide sediment rich water to the lake, causing extremely murky waters. The shoreline is mainly gravel and sand with moraines near the waters edge. It was apparent that ice melt would supply significantly more water to the lake during peak flows, noted by extensive washout areas spanning approximately 14 meters wide with the existing watercourse approximately 3 meters wide. Field investigations indicate that considerable runoff into the lake would cause a high flushing rate. Outflow for the lake is located on the southeast corner and flows for approximately 1 kilometer into Qarmaralik Cove on the Arctic coast.

The river can be characterized by steep and eroding meandering banks primarily composed of sand and gravel. The river flows over relatively steep topography causing moderate to fast water velocities. Substrate on the riverbed is composed mostly of boulders, cobble and gravel indicative of a fast flowing stream with large sediment transport capacity. Ice is protruding from the river bank approximately one meter below grade at the outflow into Qarmaralik Cove indicating the approximate depth of permafrost in the region of the lower site. At the mouth of the river, large deposits of gravel and sand are spread along the shore and into deeper waters. Fine silt and rock flour are transported further into the ocean, visible on Figure 1.

To assess the presence of fish habitat at lower areas of Fox-C, sections of the lake, river and Qarmaralik Cove were visually inspected and fished using a rod and reel. In addition, Inuit were consulted to determine if these water bodies are fished for food. Overall, field investigations of the water bodies determined that Arctic Charr (*Salvelinus alpinus*) do occupy the fresh water lake and that the river provides a corridor for the migration of Arctic Charr from the ocean to the freshwater lake. In addition, gravel substrates in the lake provide good spawning habitat for Arctic



Outflow of river into
Qarmaralik Cove.



Aerial view showing
freshwater lake and
river.



Juvenile Arctic Charr
caught in glacial
tributary to the
freshwater lake.

Charr. During the site visit, one adult charr was observed swimming upstream approximately 50 meters downstream of the lake and a second smaller charr (15 cm) individual was observed at the mouth of the river. In tributaries surrounding the lake several juvenile charr were observed, indicating that this lake is providing spawning habitat for adult Arctic Charr. Juveniles observed were in good health and measured 4-15 centimeters in length. Within the lake, one adult charr was caught, indicating the presence of either resident or migrating fish in the lake. This individual appeared healthy and had no skin abnormalities.

Discussions with several Inuit people confirmed the presence of fish in the freshwater lake. During winter months, Inuit are known to come to the lake to ice fish when charr are spawning in the lake.

1.1 Arctic Charr Biology

Arctic Charr are circumpolar in distribution and have the most northern range of any North American freshwater fish. They can spend their life in land locked lakes or in salt water making them an anadromous fish species. In Canada, Arctic Charr occupy coastal drainage areas of the Atlantic, Arctic and Pacific Ocean to a distance of 300 kilometers from shore. During summer months anadromous Arctic Charr often leave their native lake and migrate to the sea for feeding. Unlike salmon, charr do not range far from their home rivers. For example, salmon will migrate hundreds of miles from their home river whereas Arctic Charr seldom venture more than 100 kilometers. Juvenile charr feed on bottom invertebrates and larger charr feed on other fishes, such as smelt or juvenile charr (Scott and Crossman 1973).

1.2 Breeding

Females will build spawning redds (gravel pits) during the months of October to December in shallow water (1.0-4.5 m depth) of lakes. Males may fertilize the eggs from more than one female. Preferred spawning temperatures are approximately 4.0°C. Depending on conditions in the lake, Arctic Charr can remain in freshwater during winter months before returning to the ocean (Scott and Crossman 1973).

1.3 In-Water Works

Section 1 has described fish habitat in the freshwater lake and the river outflow to the Arctic Ocean. Based on field reconnaissance for the freshwater lake, it is known that juvenile arctic charr occupy tributaries to the freshwater lake during summer



Arctic Charr caught
in freshwater lake.

months and would live in this lake throughout much of the winter months. Adult charr spend most of their time at sea only returning to rivers and lakes in the winter to avoid low seawater temperatures. Female adult charr are known to potentially occupy the freshwater lake year round during the year that they spawn.

For the river, field surveys and known information on arctic charr biology indicate that the river outflow to Qarmaralik Cove serves only as a corridor for the migration of adult arctic charr into the freshwater lake for spawning. Fast flowing water over cobble does not provide good habitat for arctic charr spawning or year round occupancy of the river system.

Any activities requiring in water works should be undertaken so as to minimize interaction with arctic charr in the freshwater lake and charr migrations in the river flowing from the freshwater lake. Since arctic charr are present year round in the freshwater lake and surrounding tributaries, careful mitigation measures will be required if in water works are to occur. No in-water works should occur in the freshwater lake during potential spawning which would occur between October and December. Any potential in-water activities in the river outflow to Qarmaralik Cove should be done prior to late August when fall migration into the freshwater lake occurs.



Cotton grass (*Eriophorum scheuchzeri*) and moss (*Rhodobryum roseum*) adjacent to a tributary at the lakeshore.



Purple bladder campion located near lakeshore.

2. FLORA

During field investigations, a significant portion of the lower site was surveyed for plant and animal life to characterize the main ecosystem components of the site. In this region, the climate is harsh, restricting plant growth to only a few months per year. Generally, the lower site is characterized by undulating terrain formed by eroding glacial moraines composed mostly of sand and gravel with occasional floodplains. On the surfaces and in the crevices of most rocks, lichens and mosses were common at the upper and lower sites. In many areas extensive and ongoing erosion, a result of steep drainage areas, are causing significant substrate disturbance preventing the establishment of plants. In gently sloping areas, cold hardy vascular plants such as cotton grass (*Eriophorum scheuchzeri*) and arctic heather (*Cassiope tetragona*) were the dominant vegetation. In these locations, a nearly continuous cover of these plants was present intermixed with lichens (Brodo et al. 2001) and mosses (see Table 1 for listing). In more exposed rocky locations, arctic willow (*Salix arctica*) was found amongst a sparse distribution of low-growing herbs such as purple bladder campion (*Melandrium apetalum*) and mountain sorrel (*Oxyria digyna*). Vegetation identified in the area is typical of plants found in tundra regions of the Arctic Cordillera (Arctic Wildflowers-Baffin Island 2004). A complete listing of plant species identified during field reconnaissance is shown in Table 1.



Rock tripe located at Upper Site.



Arctic poppy near Quarmaralik Cove.



Mushroom species located near lakeshore.

Table 1 Documented flora of Fox-C

Family Name	Common Name	Scientific Name	Location at Fox-C
Caryophyllaceae (Pink Family)	Mouse-ear chickweed	<i>Cerastium alpinum</i>	Lower Site
	Purple bladder campion	<i>Melandrium apetalum</i>	Lower Site
	Moss campion	<i>Silene acaulis</i>	Lower Site
Salicaceae (Willow Family)	Arctic willow	<i>Salix arctica</i>	Lower Site
Cyperaceae (Sedge Family)	Bellardi bog sedge	<i>Kobresia myosuroides</i>	Lower Site
	Cottongrass	<i>Eriophorum scheuchzeri</i>	Lower Site
Polygonaceae (Buckwheat Family)	Mountain sorrel	<i>Oxyria digyna</i>	Lower Site
Ericaceae	Arctic wintergreen	<i>Pyrola grandiflora</i>	Lower Site
	Mountain heather	<i>Phyllodoce caerulea</i>	Lower Site
	Arctic heather	<i>Cassiope tetragona</i>	Lower Site
Saxifragaceae (Saxifrage Family)	Alpine saxifrage	<i>Saxifraga nivalis</i>	Lower Site
	Purple mountain saxifrage	<i>Saxifraga oppositifolia</i>	Lower Site
Papaveraceae (Poppy Family)	Arctic poppy	<i>Papaver radicum</i>	Lower Site
Brassicaceae (Mustard Family)	Smooth whitlow-grass	<i>Draba glabella</i>	Lower Site
Rosaceae (Rose Family)	Snow cinquefoil	<i>Potentilla nivea</i>	Lower Site
Poaceae (Grass Family)	Thrift	<i>Armeria maritima</i>	Lower Site
Equisetaceae (Horsetail Family)	Common horsetail	<i>Equisetum arvense</i>	Lower Site
Lichens	Frosted finger lichen	<i>Dactylina ramulosa</i>	Lower Site
	Rock grubs lichen	<i>Allantoparmelia alpicola</i>	Upper and Lower Site
	Yellow Map lichen	<i>Rhizocarpon geographicum</i>	Upper and Lower Site
	Rain deer lichen	<i>Cladonia rangiferina</i>	Lower Site
	Rock tripes	<i>Umbilicaria spp.</i>	Upper and Lower Site
Mosses	Moss spp.	<i>Rhodobryum roseum</i>	Lower Site
	Moss spp.	<i>Rhacomtrium lanuginosum</i>	Upper and Lower Site
Mushrooms	Arctic mushroom	Basidiomycota group	Lower Site



White-rumped
sandpiper.



Snow Bunting.



Caribou tracks
observed along
lakeshore.

3. FAUNA

During the time of field investigation, a number of bird, mammal, and arthropod species were identified at the Fox-C site. This section provides a brief account of the species documented to occur at the site, but is not inclusive of species not seen at the time of investigation or other species that may occupy portions of the site at other times of the year.

3.1 Birds

Six bird species were observed at the Fox-C site, five of which were observed only in the lower site. A Rock Ptarmigan (*Logopus mutus*) was seen at the upper site and would also likely inhabit areas of the lower site. Conversely, due to food requirements, bird species identified at the lower site would not likely occupy any portion of the upper site. Bird species identified on site are listed in Table 2.

Table 2 Documented Bird Species at Fox-C

Common Name	Scientific Name	Location at Fox-C
Rock ptarmigan	<i>Lagopus mutus</i>	Upper Site
Snow bunting	<i>Plectrophenax nivalis</i>	Lower Site
Raven	<i>Corvus corax</i>	Lower Site
Snow goose	<i>Chen caerulescens</i>	Lower Site
Thayer's/Iceland gull	<i>Larus thayeri/glaucoides</i>	Lower Site
White-rumped sandpiper	<i>Calidris fuscicollis</i>	Lower Site

3.2 Mammals

During the site visit, a polar bear (*Ursus maritimus*) and collared lemming (*Dicrostonyx torquatus*) were seen at the lower site, and numerous caribou tracks were observed along sandy portions of the lake shore. Discussions with Inuit confirmed that caribou had passed through the site several days prior to the site visit. A listing of the mammals observed at the site is shown in Table 3, however, other mammals not identified during the site visit could also potentially occupy or migrate through portions of the site (see Table 5). The collared lemming was seen amongst dense growths of arctic heather. This individual would occupy only a small portion of the lower site throughout its life. An abundance of lemming tracks were observed on the snow at the upper site indicating that ermine (*Mustela erminea*) would likely live at the upper site since lemming are a primary prey item for ermine. Polar bear and caribou on the other hand occupy vast ranges that would minimize time spent at



Collared lemming tracks observed at Upper Site.

the lower site. It is unlikely that caribou would occupy the upper site due to a relative abundance of vegetation at the lower site. Polar bear could potentially venture to the upper site; however, any time spent at this location would be unlikely or infrequent.

Table 3 Documented Mammals at Fox-C

Common Name	Scientific Name	Location at Fox-C
Collared Lemming	<i>Dicrostonyx torquatus</i>	Lower and Upper Site
Polar Bear	<i>Ursus maritimus</i>	Lower Site
Caribou	<i>Rangifer tarandus</i>	Lower Site

3.3 Arthropods

Many insect species live in the Arctic and show a wide range of adaptations to its extreme severity and seasonality. At the time of this field investigation, numbers of arthropods observed were minimal, but four species were identified at Fox-C. Two species of arachnids were seen at the upper and lower site; however, the species could not be identified. At the lower site the flat-backed kelp fly (*Coelopa vanduzeei*) was scarce along the lakeshore and at Qarmaralik Cove (National Audubon Society 1980). Along the lakeshore one caterpillar, an arctic wooly bear (*Gynaephora groenlandica*), was observed (National Audubon Society 1980). Table 4 provides a listing of the arthropods observed at Fox-C.



Arctic Wooly Bear Caterpillar on lakeshore.

Table 4 Documented Arthropods at Fox-C

Common Name	Species Name	Location at Fox-C
Two Spider Species	Order Araneae	Lower and Upper Site
Arctic Wooly Bear	<i>Gynaephora groenlandica</i>	Lower Site
Flat-backed kelp fly	<i>Coelopa vanduzeei</i>	Lower Site



Polar Bear

4. SPECIES AT RISK

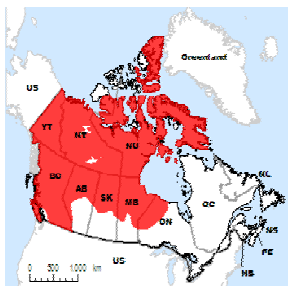
This section discusses three species, the Peregrine Falcon (*Falco peregrine*), Wolverine (*Gulo gulo*) and Polar Bear (*Ursus maritimus*) which have a designation of “special concern” under The Species at Risk Act (SARA) and The Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This designation is given to any wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats (Species at Risk, Internet Resources 2004).

4.1 Peregrine Falcon, tundrius subspecies

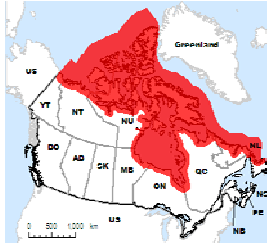
The Peregrine Falcon (*Falco peregrine*) has three distinct geographic distributions. The tundrius subspecies also known as the Arctic Peregrine breeds in tundra regions of Baffin Island and other regions of Canada, Alaska and Greenland. This species is highly migratory, traveling as far south as Argentina and Chile. During times of the year when the birds are nesting, a peregrine has an expansive home range of up to 27 kilometers, hunting over open tundra, seacoasts and high mountains. Major threats to the Peregrine Falcon include organochlorine compounds that cause egg shell thinning and reduced hatching success. Since this species is at the top of the food chain, their tissues have the potential to accumulate these substances (Species at Risk, Internet Resources 2004).

4.2 Wolverine, western population

The exact size of the western population of Wolverine (*Gulo gulo*) is not known due to their solitary nature and extremely large hunting range. The Wolverine once occupies much of mainland Canada, but now occupies the alpine tundra of the Rocky Mountains and arctic areas. Reproduction rates of the wolverine are very low, being less than one offspring per female per season. Threats to Wolverine include intensive hunting of ungulates (such as caribou) which are the principle food item for Wolverine, trapping for fur, and poisoning for wolves (Species at Risk, Internet Resources 2004).



Distribution of
wolverine, western
population.



Distribution of
Polar Bear.

4.3 Polar Bear

The Polar Bear (*Ursus maritimus*) is circumpolar in distribution occupying ice covered regions from Labrador to the Alaskan border and from James Bay to northern Ellesmere Island. The world population is estimated at 22, 000 – 27 000 with 15, 000 Polar Bears occurring in Canada. There are approximately 19 relatively discreet Polar Bear populations in the arctic with 14 of these areas located in or shared by Canada. Climate, ice conditions and the presence of prey (especially Ringed Seals) influence Polar Bear movement and migration. There are numerous threats to Polar Bears, the largest thought to be hunting pressures. Additional threats include bioaccumulation of contaminants in their prey species, and the speculation of climatic warming impacting on hunting and survival success (Species at Risk, Internet Resources 2004).

5. RECOMMENDATIONS FOR THE ECOLOGICAL RISK ASSESSMENT (ERA)

This report has outlined species observed during a site visit to the Ekalugad Fjord DEW Line Site in late August 2004. Field investigations documented numerous plant and animal species typical of regions in the Arctic Cordillera ecozone that may interact with CoCs identified at the upper and lower areas of the site. However, due to a vast distribution and home range of many bird and mammalian species, it was not possible to document all animal species that would occupy portions of the DEW Line Site, during the site visit. For this reason, Table 5 includes a list of species that should be considered for the ERA that have either been documented to occur at the site or are known to most likely occur at the site based on professional judgment and or consultation with Inuit people. Species at Risk are noted in Table 5 and are discussed in more detail in Section 4.



Wolverine (*Gulo gulo*).



PhotoImage: Dr. Gordon Court

Peregrine Falcon, tundra subspecies (*Falco peregrine*).

Table 5 Recommended Species for the Ecological Risk Assessment

Common Name	Scientific Name
Arctic Charr	<i>Salvelinus alpinus</i>
Arctic Fox	<i>Alopex lagopus</i>
Arctic Hare	<i>Lepus timidus</i>
Arctic Wolf	<i>Canis lupus arctos</i>
Caribou	<i>Rangifer tarandus</i>
Ermine (weasel)	<i>Mustela erminea</i>
Gyr Falcon	<i>Falco Rusticolus</i>
Lemmings	<i>Dicrostonyx torquatus</i>
Peregrine Falcon, tundra subspecies	<i>Falco peregrinu</i> *
Polar Bear	<i>Ursus maritimus</i> *
Rock Ptarmigan	<i>Lagopus mutus</i>
Snow Bunting	<i>Plectrophenax nivalis</i>
Snow Goose	<i>Chen caerulescens</i>
Wolverine, western population	<i>Gulo gulo</i> *
* Species at Risk, Special Concern on Schedule 3.	



Shoreline of
freshwater lake.



River flowing
towards Quarmaralik
Cove showing
topography of Fox-
C.

CLOSURE

This report describes the natural environment of the Fox-C site during a site visit on August 26 and 27, 2004. Species documented in this report are restricted to the time frame of the field investigation and may underestimate the flora and fauna which occupy the site during the year. The Fox-C DEW Line site is representative of arctic tundra regions located in the Arctic Cordillera of Baffin Island. Topography of the landscape at Fox-C is diverse creating many habitat niches for juvenile and adult Arctic Charr, and a variety of arctic flora and fauna. Any activities requiring in water works should be undertaken so as to minimize interaction with arctic charr in the freshwater lake and charr migrations in the river flowing from the freshwater lake. Three species having designations of Special Concern under the Species at Risk Act and The Committee on the Status of Endangered Wildlife in Canada are either known to occur at Fox-C or likely have distributions that would include areas of Fox-C during portions of the year.

We trust the above meets your present needs.

Respectfully Submitted,

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Appendix 1

Photographic Record



Photo 1: Aerial view of the Ekalugad Fjord.



Photo 2: Aerial view of the freshwater lake and riverine outflow to Qarmaralik Cove in the Arctic Ocean.



Photo 3: Shoreline view of the freshwater lake with caribou tracts in the sand.



Photo 4: Vantage of the Ekalugad Glacier from camp at the Lower Site.



Photo 5: Glacial outflow to the freshwater lake adjacent to the camp at the Lower Site.



Photo 6: One of numerous glacial tributaries to the freshwater lake, showing sand and gravel substrate that occupies much of the Lower Site.



Photo 7: A glacial tributary to the freshwater lake where juvenile Arctic Charr were observed swimming.



Photo 8: Outflow from the freshwater lake showing topography of the Lower Site, including areas of eroding silt substrate.



Photo 9: Mouth of river at Quarmaralik Cove.



Photo 10: View of the freshwater lake at the Lower Site from the Upper Site.



Photo 11: Upper Site showing existing DEW Line infrastructure.



Photo 12: Lemming tracks visible in the snow at the Upper Site.



Photo 13: Juvenile Arctic Char observed swimming in a glacial tributary to the freshwater lake.



Photo 14: Numerous caribou tracks observed on the shoreline of the freshwater lake.



Photo 15: Snow goose tracks observed on the shoreline of the freshwater lake.



Photo 16: Polar Bear tracks observed along the shore line of the freshwater lake.



Photo 17: Arctic Charr caught by rod and reel in the freshwater lake.



Photo 18: Lemming found beneath a board at the Lower Site.



Photo 19: One of numerous mushrooms observed in sand and gravel portions of the lower site.



Photo 20: Cotton grass (*Eriophorum scheuchzeri*) and moss (*Rhodobryum roseum*) growing in an area of water seepage.



Photo 21: Typical vegetative mat at the Lower Site found in more gently sloping areas. Vegetation consists mainly of Heather spp., lichen spp., and moss (*Rhodobryum roseum*).



Photo 22: Lichen and heather species cover gravel substrate at the Lower Site.



Photo 23: Purple bladder campion observed at Lower Site (*Melandrium apetalum*).



Photo 24: Moss campion (*Silene acaulis*) observed at the Lower Site.



Photo 25: Common horsetail (*Allantoparmelia alpicola*) observed on silt adjacent to the river outflow from the freshwater lake at the Lower Site.



Photo 26: Thrift (*Armeria maritime*) observed at Lower Site growing in cobble substrate.