Flora and fauna at Moriusaq, North-west Greenland
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1 INTRODUCTION

Dundas Titanium A/S proposes to explore a titanium rich black sand deposit on the south coast of Steensby Land near Pituffik in North-West Greenland. To obtain an exploration license the Greenland Authorities require an Environmental Impact Assessment (EIA) prepared. This report contains up-to-date background information on flora and fauna for the EIA for Dundas Titanium’s project.

The geographical scope of the report is shown on Figure 1. In addition to Dundas Titanium’s license area, this includes Manson Islands and Tree Sister Bees islands. In the following, these sites are collectively referred to as “the assessment area”.

Because shipping to and from the proposed mine site at Moriusaq passes through the eastern part of the North Water Polynya (NOW), information on marine mammals and a number of seabirds has been included that are mainly associated with eastern NOW (and not the assessment area as such).

Figure 1. The assessment area covered in this report (yellow circle). For a few species (mainly marine mammals) a larger area is included
This report covers mammals, birds and vegetation. A few marine fish recorded during the field work are also included. Walrus, narwhale and white whale were subject to a specific aerial survey which is reported in Orbicon 2020a. Specific studies of the benthic flora and fauna is reported in Orbicon 2020b.

The data for the present document are sources from published and un-published reports and papers as well as field studies carried out specifically for the EIA for the mine project in 2016, 2017 and 2018. In addition, information has been provided by hunters interviewed in Qaanaaq, some of which previously lived in Moriusaq.

Chapter 2 provides a brief overview of the main landscape features of the assessment area and a description of the North Water Polynya next to the assessment area.

Chapter 3 and 4 comprises brief accounts of the terrestrial and marine mammals and birds that occur regularly in the assessment area. A list of marine fish caught as “by catch” during the baseline sampling of sculpins is also included in Chapter 5.

Chapter 5 deals with the vegetation. This chapter describes the main plant communities and includes lists of recorded plant species.
2 FIELD SURVEY METHODS

2.1 Mammals, birds and fish
Observations of mammals and birds were carried out during the two week field campaigns to the assessment area (Figure 1) in 2016, 2017 and 2018.

This included a specific survey of breeding Common eider and Arctic tern on Manson Islands, Tree Sister Bees islands and a small island off Moriusaq in 2016. The other observations were mostly as hoc observations in connection with other field activities, such as base line sampling and studies of the benthic flora and fauna. Most of these activities took place along the coast line of the assessment area and on the coastal plains. Only few visits were made to the mountains further inland.

Marine fish species were recorded only from the four baseline stations situated along the coast of the assessment area and on mason Islands.

2.2 Vascular plants
Ad hoc recording of vascular plant species was also carried out during the field work in 2016-2018.

In addition, a specific vegetation survey was carried out in August 2017 along ten transects across the coastal plains from the coast to the lower slopes of the inland mountains (Figure 2). Here all plant species were identified and mapped according to the classification in Fredskild (1998). The vegetation was subsequently classified into plant communities. These data and high resolution aerial photo were subsequently used to extrapolate the vegetation pattern of the entire coastal plains.
3 THE ASSESSMENT AREA

3.1 Main landscape features

The land part of the assessment area is dominated by broad coastal plains stretching from the coast line to low inland mountains (Figure 3). In the western part of the license area the coastal plains are 1 – 2 km wide, while further east the plains progressively become narrower with the mountains almost reaching the coastline in some places. Further inland the mountains rises further and are covered by permanent ice.

The vegetation of the coastal plains is mostly high arctic dwarf-shrub heath, fens and fell-fields. Throughout the plains are also several small and shallow freshwater lakes. A number of small streams drain the plains during the brief summer. Two larger rivers (Iterlak and Pinguarsuit) cut through the area, bringing silty glacial water to the fjord. The higher ground further inland has generally very sparse or no vegetation at all.

Figure 3. Typical coastal plains at Moriusaq with dwarf-shrub heath
The coast is dominated by sandy shores and with smaller sections of low cliffs. Two groups of small islands (Manson Islands and Three Sister Bees) are situated off the coast but are not part of the license area. The marine area off the coast includes a number of shallow areas with depths around 20-30 metres but also deep channels where the depth reached 200 – 300 m. More information on the sea floor and its inhabitants is presented in Orbicon 2020b.

### 3.2 North Water Polynya

The assessment area is bordering the North Water Polynya (NOW), (Figure 5). This large marine area between Northwest Greenland and Ellesmere Island at c.76°N to 79°N and 70°W to 80°W has persistent thin ice with cracks even in mid-winter. The NOW evolves seasonally from a relatively small area in winter, where ice is thinner than elsewhere, to a large area of ice-free water in June and ultimately in summer ceases to exist as a distinct ice-bounded region within Baffin Bay.

Although the area often has 95 % ice cover in January, this ice is mobile and crisscrossed by open leads (Melling et al. 2001). Exceptionally for Arctic areas, phytoplankton biomass and primary productivity starts very early in April and is high throughout
the ice-free period. The high primary production results in a diverse zooplankton community that provides food for large numbers of fish, marine mammals and sea birds.

Sea ice in the NOW usually shows a peak in extent of distribution in March, then a decline during April and May until open water prevails in June–July but there is considerable annual variation in the extent of ice coverage in all months (Heide-Jørgensen et al. 2013). As an example, the sea ice coverage in the NOW was estimated to be c. 4,000 and c.10 000 km$^2$ on June 1, 2009 and 2010, respectively and the 50 % open-water level was reached around May 1 in 2009 and around May 25 in 2010, again confirming the large inter-annual variability (Heide-Jørgensen et al. 2013).

Biologically, the NOW is one of the most important marine areas in Greenland. In a recent study Christensen et al. (2012) identified ecologically valuable and sensitive marine areas in relation to shipping activities in Greenlandic waters. This was done by following 11 criteria for designating Particularly Sensitive Sea Areas (PSSA) in line with the International Maritime Organisation’s (IMO) guidelines. The study identified 12 PSSA’s in Greenland that were ranked in four priority categories. Two of these were ranked Priority 1 (the highest ranking), one of which was the North Water Polynya.
4 MAMMALS

4.1 Marine mammals

4.1.1 Polar bear *Ursus maritimus*

Polar bears are relatively common in the NOW where they are mainly found in drift ice and ice edges (Boertmann & Mosbech 2017). Satellite tracking of tagged polar bears suggest, that in particularly the northern, western and southern parts of the NOW is visited by polar bears, while instrumented polar bears made little use of the eastern NOW (and the Melville Bay area) (Boertmann & Mosbech 2017). This was thought to be an avoidance response due to a relatively high hunting pressure in these areas (Taylor *et al.* 2001). The distribution of polar bear catches in Northwest Greenland also confirms that polar bears shot in the NOW area are mainly shot in the eastern part (Born *et al.* 2008). However, the catch data also confirms that at least some polar bears occasionally venture into this part of the NOW.

As is the situation elsewhere in the Baffin Bay area polar bears are mainly present in the NOW area during autumn, winter and spring. This is because most polar bears followed the spring retreat of the pack ice towards the west and spend the open-water season in Canada (Boertmann & Mosbech 2017).

According to hunters in Qaanaaq polar bears are occasionally observed inside the assessment area, mainly in spring.

**Greenland Red List status:** Vulnerable (Den grønlandske rødliste 2018)

The polar bear populations in Baffin Bay and Kane Basin in 2017 are estimated to 2,826 and 357 animals, respectively (IUCN/SSC Polar Bear Specialist Group 2018).

4.1.2 Walrus *Odobenus rosmarus*

Walruses occurring in Northwest Greenland are part of the Baffin Bay population (Stewart *et al.* 2014, Oberborbeck Andersen *et al.* 2018). This population is shared between Northwest Greenland and eastern Ellesmere Island in Canada.

In Northwest Greenland the Baffin Bay walruses occur between Cape Inglefield in the north and Cape York in the south (Vibe 1950, Born *et al.* 1995, 2015). Within this area their distribution is mainly determined by depths between 10 and 100 m for feeding (Garde *et al.* 2018) and fast-ice or drifting ice pans for hauling out (Heide-Jørgensen *et al.* 2017).

As the coastal sea ice melts away from Northwest Greenland during May and early July the Baffin Bay walruses leave Greenland waters, swim across Smith Sound and spend the summer in Canada where coastal sea ice remains throughout the summer.
months (Heide-Jørgensen et al. 2013, Heide-Jørgensen et al. 2017). This correspond with the timing for sea ice clearance off Moriusaq and in Wolstenholme Fjord which was between 5th June and 21 July in 2009 – 2018 (DMI 2019).

Walruses are therefore virtually absent during the open-water season in Greenland waters, except for a few stragglers (Stewart et al. 2014, Born et al. 2017).

In autumn, as new ice starts forming along the Northwest Greenland coasts, the walruses return (Heide-Jørgensen et al. 2017). In the first half of the 20th century, Vibe (1950) and Holtved (1944) described how walruses sometimes were present in Wolstenholme Fjord in September to early October. However, there are indications that in recent years the walruses return later, probably because fast ice is formed later. In the years 2009 – 2018 sea ice formation off Moriusaq and in the bottom of Wolstenholme Fjord started between 9th October and 2nd November (DMI 2019).

As the sea ice thickens most walruses are forced away from the coast again. However, there is very little exact knowledge about where the Baffin Bay walruses stay in mid-winter. The majority probably overwinter in leads and areas of open water in the North Water Polynya (NOW) between Greenland and Canada although a few stragglers may also remain leads in Wolstenholme Fjord in some years. Recent observations indicate that some walruses may also winter further to the south-east (Boertmann and Mosbech 2017).

In some years leads and open water of the NOW almost reach the Greenland coast potentially making it possible for walruses to utilize shallow banks near land all winter. In other years heavy ice covers the coastal areas in Greenland until March-April. However, as soon as the heavy sea ice along the coast breaks up, the walruses arrive and start feeding on mussels (Freuchen 1921, Steen Svensson pers. com.). In the first half of the 20th century, there was apparently also an influx of walruses into the North Water – including the Wolstenholme Fjord system - from the south during June and July (Freuchen 1921, Vibe 1950).

Greenland Red List status: Vulnerable (Den grønlandske røddliste 2018)

Population size: The Baffin Bay winter population is estimated to c. 2,500 animals (Heide-Jørgensen et al. 2016).

More information on the distribution of walruses in and around the assessment area and the timing of spring and autumn migration is found in Orbicon 2020a.
4.1.3 Hooded seal *Cystophora cristata*

The occurrence of this migratory seal in Northwest Greenland is not well understood. The vast majority of hooded seals belonging to the Northwest Atlantic population concentrate in the whelping areas off Newfoundland and in the Davis Strait during March-early April (Stenson *et al.* 1996). In late April-May, most of these seals swim toward Southeast Greenland, and almost the entire population moults on the drift ice there during late June-July. While most juveniles stay off the Greenland east coast, adult seals migrate toward the Davis Strait and Baffin Bay during the end of July (Andersen *et al.* 2009). A large fraction of the adult seals move up into the Baffin Bay in September, and until November they forage on the steep part of the shelf in Baffin Bay (Andersen *et al.* 2009).

However, some hooded seals also move further north along the west coasts in spring, as small numbers are recorded from the NOW and adjacent fjords throughout the open water period from May/June until October/November (Qaanaaq hunters pers. com.).

**Greenland Red List status**: Vulnerable (Den grønlandske rødliste 2018)

**Northwest Atlantic population**: c.500,000 (Boertmann 2008)

4.1.4 Bearded seal *Erignathus barbatus*

Bearded seals are probably present in and around the license area throughout the year. But since this seal species usually only make breathing holes in relatively thin ice, they avoid areas with thick shore-fast ice and instead concentrate along the ice edge and in the shear zone. This implies that in the NOW area the bearded seals are very mobile, as they follow the pulse of the expanding and shrinking sea ice (Boertmann & Mosbech 2017).

During aerial surveys of the assessment area and adjacent waters in June 2016-2018 (Orbicon 2020a), this large seal was observed in low numbers throughout the assessment area, but none were recorded during the aerial surveys in September-October. Based on an aerial survey in the Greenland part of the North Water in April 2014 Heide-Jørgensen *et al.* (2016) estimated 6,005 bearded seals.

**Greenland Red List status**: Least concern (Den grønlandske rødliste 2018)

**Greenland population**: unknown (Boertmann 2008).
4.1.5  Harp seal *Pagophilus groenlandicus*

Harp seals are migratory. They breed off Newfoundland, and many animals later move north along the Greenland west coast during summer and early autumn. A few animals reach the NOW in September, but as the sea ice starts to form in October, they initiate their migration back toward the whelping grounds. During summer, most adult harp seals will forage on fish in pods that typically consist of 5-20 individuals, while juvenile seals forage alone (Boertmann & Mosbech 2017).

According to hunters in Qaanaaq, this seal species has become “common” in recent years in Inglefield Bredning during late summer and early August. During aerial surveys of the assessment area and adjacent waters several pods of harp seal were also observed in September and October 2016-2018.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland population:** unknown (Boertmann 2008).

4.1.6  Ringed seal *Phoca hispida*

This is by far the most common seal species in North Greenland and ringed seals are most likely present in and around the assessment area in high numbers throughout the year. They make breathing holes in the new ice, and adult seals establish territories and maintain breathing holes throughout the winter (Boertmann & Mosbech 2017). Ringed seals mainly prey on polar cod, arctic cod and amphipods in nearshore waters (Siegstad et al. 1998).

During aerial surveys in June 2016-2018, large numbers of ringed seals were observed in areas with fast ice where the breathing holes and hauled out seals could easily be seen from the air. This included Granville Fjord and the eastern section of Wolstenholme Fjord which at the time of the surveys were covered with fast ice. A few ringed seals were also observed in areas with drift ice, but here the seals were much more difficult to detect. Only few ringed seals were observed during aerial surveys in September-October 2016-2018, but this is most likely because the seals are much more difficult to spot when they are swimming.

Ringed seals give birth in March-April in lairs dug out in a snowdrift covering a breathing hole (Boertmann & Mosbech 2017). The seals start molting their fur in May, and this period overlaps with the breeding and nursing period. The regrowth of new hairs is facilitated by increased blood supply to the skin and the seals will therefore spend most of the day basking in the sun on the ice during June.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland population:** unknown (Boertmann 2008).
Breeding ringed seals depend on stable sea ice during the months when they give birth and nurse their pups (March-May). Such stationary behaviour makes the animals vulnerable to disturbance, particularly to activities disrupting the stable ice.

4.1.7 Minke whale *Balaenoptera acutorostrata*

Minke whale is the smallest baleen whale species in the northern hemisphere. Minke whales are regular summer visitors along the Greenland west coast north to Upernavik. However, in recent years a few animals have also been reported as far north as Siorapaluk, most likely as a result of climate change (Boertmann & Mosbech 2017).

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018).

**Greenland population size:** 3,500 – 4,000 animals in West Greenland in 2005 (Boertmann 2008).

4.1.8 White whale *Delphinapterus leucas*

White whales that occur in NW Greenland belong to a population that spends the summer in Canadian High Arctic waters and winters in either the North Water Polynya (NOW) or off central West Greenland (Heide-Jørgensen *et al.* 2016).

In spring, white whales that spend the winter off West Greenland, are believed to cross Baffin Bay somewhere at the latitude of Upernavik (about 73°N), and arrive at
the ice edge in Lancaster Sound in Canada in May and June (Heide-Jørgensen et al. 2010).

Almost nothing is known about the spring movements of the white whales that winter in the NOW. However, it is likely that they also move east and northeast towards the Canadian Arctic Archipelago, as soon as sea ice conditions permits.

The migration from Canada towards the wintering area off West Greenland takes place in October-November (Ugarte et al. 2011). However, during aerial surveys of the sea southwest of the Steensby Land peninsula, large numbers of white whales were also observed in second half of September (Orbicon 2020a). This appeared to include mainly whales on migration, but also animals pausing to feed on fish in the fjords (Orbicon 2020a).

Greenland Red List status: Vulnerable (Den grønlandske rødliste 2018)

Population size: the number of white whales wintering off West Greenland was in 2012 estimated to 9,072 (Heide-Jørgensen et al. 2017), while the number wintering in the Greenland part of the NOW is estimated to 2,324 (Heide-Jørgensen et al. 2016). More information on the distribution of white whales in and around the assessment area and the timing of autumn migration is found in Orbicon 2018.

4.1.9 Narwhale Monodon monoceros

The narwhales that occur in the assessment area are believed to belong to the population that concentrates in Inglefield Bredning in summer and either winters in the eastern part of the North Water Polynya (NOW) or further south in central Baffin Bay (Heide-Jørgensen et al. 2016).

In spring, narwhals from the wintering area in Baffin Bay move north along the ice edges off West Greenland and concentrate in the NOW before entering Inglefield Inlet (Born et al. 1994, Heide-Jørgensen 2004, GiNR unpubl. data) in May-June.

In autumn, narwhales begin to leave Inglefield Bredning in September, with the last animals leaving, as fast ice starts to form around mid-October. In recent years this has usually been delayed until mid-November. After leaving Inglefield Bredning, part of the population remains in eastern NOW, while other move to wintering grounds in Baffin Bay.

During aerial surveys of the assessment area and surroundings, only few narwhales were recorded during the spring surveys (in June), suggesting that the majority of narwhales remain further to the west on their spring migration from Baffin Bay towards Inglefield Bredning (Orbicon 2020a).
In autumn, a few pods were seen in the assessment area and adjacent Granville Fjord in October (Orbicon 2020a). This indicates that most narwhales avoid entering the fjords south of Steensby land on their autumn migration (Orbicon 2020a).

**Greenland Red List status:** Near threatened (Den grønlandske rødliste 2018).

**Population size:** In 2007, the summer population in Inglefield Bredning was estimated to 8,368 animals (Heide-Jørgensen et al. 2010). In 2014 the winter population in the NOW was estimated to 3,059 animals (Heide-Jørgensen et al. 2016).

More information on the distribution of narwhales in and around the assessment area and the timing of spring and autumn migration is found in Orbicon 2020a.

### 4.2 Terrestrial mammals

#### 4.2.1 Arctic fox *Alopex lagopus*

Arctic fox is a widespread and generally common species throughout Greenland, especially in areas where it is not hunted. Foxes are opportunistic feeders, and their diet includes birds as well as fish and mussels found along the shore.

During field work in 2016, 2017 and 2018, foxes were regularly observed foraging along the mainland coast near Moriusaq. A den was observed on the largest of the Three Sister Bees islands in 2016 and on Manson Island in 2017. The occurrences of foxes on the small island are expected to be highly variable and accidental. However, their presence may be of great importance to breeding waders, ducks and gulls on the islands. Accordingly, it is likely that the populations of eiders and other birds are adapted to move between islands in order to find islands without foxes.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland population:** unknown, but large (Boertmann 2008).

#### 4.2.2 Wolf *Canis lupus*

Wolves in Northwest Greenland belong to the small “Polar wolf” population endemic to Ellesmere Island and Greenland (Sinding et al. 2018).
Almost nothing is known about the status and biology of wolves in Greenland. This includes the assessment area from where there appears to be no recent sightings. However, according to hunters in Qaanaaq, wolves have been more commonly observed in recent years, mainly to the northwest of the town.

**Greenland Red List status:** Vulnerable (Den grønlandske rødliste 2018)

**Greenland population:** unknown, but a suggested total Polar wolf population includes 200 – 500 animals.

### 4.2.3 Arctic hare *Lepus arcticus*

This is a common species throughout Greenland which is particularly common in the north. Numbers fluctuate between years, mostly due to winter conditions. Sedges, grasses and rushes, as well as willow, are primary food items of the Arctic hare in Greenland.

In August 2016, 2017 and 2018, single animals and small groups were regularly observed, mainly on slopes of low mountains. However, pellets were commonly found throughout the coastal plains, including inside Moriusaq. This suggests that over the years, hares utilize most of the area.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland population:** unknown, but large (Boertmann 2008).

### 4.2.4 Muskoxen *Ovibos moschatus*

Muskoxen were once indigenous to the Thule region, but were hunted to extinction in the 1800’s. In 1986, seven juvenile muskoxen were translocated to Cape Atholl close to Thule Air Base. In September 2015, this population was assessed to 276 animals within the area marked on Figure 7 (Cuyler *et al.* 2016). There are no indications that the muskoxen will colonize the neighbouring areas.
4.2.5 Caribou *Rangifer tarandus*

The indigenous Caribou population in the Qaanaaq area went extinct in the 1930’ies, but nine semi-domestic reindeer were introduced to Olrik Fjord in 1965. Today descendants of the re-introduced animals appear to be mainly limited to a small area north of Olrik Fjord (Figure 7). Hunters in Qaanaaq report that caribou occasionally are observed further to the west near the mouth of Olrik Fjord (pers. com.).
5 BIRDS

Below are brief descriptions of the birds that are either known or expected to breed regularly or to moult in large number in the assessment area. Included are also a number of seabirds that breed outside the assessment area on islands such as Saunders Island but regularly forage in the marine part of the assessment area.

The majority of birds are migratory species arriving in May-June and leaving in September-November. Exceptions are ptarmigan, gyrfalcon and raven that occur in small numbers throughout the year.

5.1.1 Snow goose *Anser caerulescens*

The Snow goose breeds in small numbers in North Greenland. The key area is the Qaanaaq/Thule region (Boertmann 2008).

This goose appears to be a fairly common breeding bird in the assessment area. There are also indications that flocks non-breeding snow geese congregate in the area during summer, possibly to moult.

In August 2016 flocks of adults with large goslings were observed on Manson Island (probably around seven breeding pairs), the Three Sister Bees (c. 20 breeding pairs) and along the coast of the mainland out of Manson Island (c. 10 breeding pairs).

Figure 8. Snow geese *Anser caerulescens* near Moriusaq in mid-August 2016
In August 2017, no breeding pairs were observed on the islands. However, several flocks of juvenile birds were observed on the coast of Steensby Land, and it is likely that part of these birds originated from breeding pairs on Manson and Three Sisters Bees.

Flocks of 25 – 150 adults with no goslings were also observed feeding and resting along the south coast of Steensby Land close to Moriusaq in July-August 2016, 2017 and 2018.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 1,000 – 2,000 pairs (Boertmann 2008).

### 5.1.2 Canada goose *Branta canadensis*

This goose species began to breed in Greenland in the 1980s, and since then the population has been increasing in west Greenland (Boertmann 2008). In recent years small numbers has also bred at Thule Air Base (Steen Svensson pers. com).

In August 2017 a flock of 27 adult and juveniles were observed on the coast east of the Iterlak delta. It is unknown if the geese belonged to the breeding population at Thule Air Base or had bred elsewhere in the region.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 2,500 – 10,000 in 2004 (Boertmann 2008).

### 5.1.3 Common eider *Somateria mollissima*

This sea duck is widely distributed in Greenland, only missing from the far north. It breeds both dispersed and in colonies on low islands and feeds in shallow coastal waters throughout the region (Boertmann & Mosbech 2017).

Within the assessment area large breeding colonies are found on Manson Islands and Three Sister Bees islands but no breeding seems to take place on the mainland.

The eider populations on Manson Islands and Three Sister Bees islands have increased significantly in recent years (Burnhams *et al.* 2012). To estimate the size of the current breeding populations of eiders on these islands, the number of eider nests was counted on the Manson Islands and Three Sister Bees islands in August 2016.
The larger of these islands were systematically surveyed in order to estimate the number of breeding pairs. The islands were visited by boat, and the nest survey was conducted during a single visit to each island. Two surveyors counted the nests believed to have been active in 2016 along transects in accordance with the method described in Burnham et al. (2012) except that transects were further apart and the counted nests were not marked.

![Image](76022_Three_Sister_Bees.png)

Figure 9. Three Sister Bees and Manson Islands (map from Burnham et al. 2012). The five-digit colony codes refer to Greenland seabird colony database

The results of the 2016 survey are shown in Table 1. The number of eider nests on the Three Sister Bees was of the same magnitude as recorded in 2009, but the distribution between the islands is very different. This was probably due to one or several Arctic foxes on the larger of the Three Sister Bees in 2016, where clear signs of active dens were observed during the survey. There was no sign of foxes on island “C”, and many eiders have probably moved to this island to breed.

![Image](76001_Manson_Is.png)

Table 1. Number of nesting Common Eiders *Somateria mollissima* on Three Sister Bees islands and Manson Islands. Data from 2009 are from Burnham et al. (2012). Data from 1997-1998 are from Christensen & Falk (2001)
The results of the survey of Manson Islands suggest a 40% increase in the breeding population since 2009. The increase may be even larger, as it was not possible to survey island “C” in 2016.

With a total breeding population of almost 10,000 pairs of Common Eider, Three Sister Bees and Manson Island holds a very significant part of the West Greenland breeding population (estimated to 50,000 – 63,000 pairs in 2011 by F. Merkel cited in Burnham et al. 2012).

At the time of the field survey (10-22 August 2016) almost all the breeding eiders had left the colonies and the assessment area. A single eider hen was flushed from an active nest on the largest of the Three Sister Bees islands on 11 August, and two small flocks of females with small ducklings were observed at the Three Sister Islands on the same day. Except for that all eiders with ducklings appeared to have left the assessment area, as none were observed along the coast of the mainland or at the islands. The only eiders observed in the assessment area during the field survey were a few flocks of 30-50 females without ducklings. Outside the assessment area two small flocks of eiders with ducklings were observed in North Star Bay on the 20-23 August 2016, while no eiders were seen during a brief visit to the northern coasts of Saunders Island on 19 August 2017. In late July – early August 2017, several flocks of females with ducklings were observed along the coast.

In 2017, staff from the DCE instrumented 10 female common eiders that were breeding on Manson Island with satellite transmitters in order to track their post-breeding use and migratory behaviour (Johansen et al. 2018). Preliminary results show that after completing the breeding season in late July, the tracked eiders stayed in Wolstenholme Fjord until mid-October/early-November, when the sea ice started to form. They primarily stayed in shallow (< 50 m of depth) sheltered areas along the coasts, and concentrations were observed around Ptuflik (TAB), Kap Atholl, Wolstenholme Ø, the very bottom of Wolstenholme Fjord and at the mouth of Granville Fjord (Figure 9). The area around Ptuflik seems to be of particular importance, as almost all of the tracked birds spent time there at some point during the post-breeding period (Johansen et al. 2018).

This is in contrast to the southwest coast of Steensby Land, where only few birds were observed in early August 2016-2018. This is most likely due to the limited feeding opportunities for the ducklings in the littoral (intertidal) zone, as described in Orbicon 2020b.

**West Greenland Red List status:** Least concern (Den grønlandske rødliste 2018)

**West Greenland breeding population:** 50,000 – 63,000 pairs in 2011 by F. Merkel cited in Burnham et al. 2012.
5.1.4 King eider *Somateria spectabilis*

King eiders is a rare breeding bird in NW Greenland, but birds from breeding sites in Canada and inland Greenland assemble to moult in remote bays and fjords of the North Water Polynya from July to September. This includes Booth Sund around 20 km northwest of the assessment area (Boertmann & Mosbech 2017). In spite of the proximity of these moulting areas, only very few king eiders were observed during the field work in August 2016, 2017 and 2018.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 2,000-5,000 pairs (Boertmann 2008).
5.1.5 Long-tailed duck *Clangula hyemalis*

This small sea ducks breeds throughout Greenland. In northern Greenland it is a relatively common and widespread breeding bird at lakes. This includes the Thule Air Base area (Vaughan 1988).

A few Long-tailed duck were observed resting and feeding on lakes in the assessment area and off the coast. Although no definite proof exist, it is likely that few pairs at least in some years breed in the assessment area.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland population:** 10,000 – 30,000 pairs (Boertmann 2008).

5.1.6 Red-throated diver *Gavia stellata*

This relatively common diver breeds at lakes throughout Greenland.

Red-throated diver was recorded breeding in small numbers on lakes in the assessment area, as one pair was observed on a lake on the south coast of Steensby Land in August 2016 and a bird with one chick was observed in the shallow freshwater lake 5 kilometre east of Moriusaq in 2017. In 2016, a pair with a young was also observed on a lake on Manson Island.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 5,000 – 30,000 pairs (Boertmann 2008).

5.1.7 Fulmar *Fulmarus glacialis*

This seabird breeds in colonies on cliffs in large parts of Greenland. Fulmars are not breeding inside the assessment area, but a colony with 1,000-5,000 pairs is located on Saunders Island (Boertmann & Mosbech 2017).

Foraging fulmars are relatively common in the assessment area, where they are mostly observed far from the coast (typically 1-2 km). Most of these fulmars probably belong to the breeding population on Saunders Island.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 120,000 – 200,000 pairs (Boertmann 2008).
5.1.8  Ptarmigan *Lagopus mutus*

The ptarmigan is widespread throughout Greenland, their numbers varying from year to year.

During fieldwork in 2016, 2017 and 2018 only few ptarmigans were observed close to Moriusaq. However, ptarmigan droppings were common throughout the assessment area, suggesting that the species is more common in some years, and then utilizing most of the land area. The species most likely breeds in the area, although definite proof is lacking.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 50,000 – 500,000 pairs (Boertmann 2008).

5.1.9  Peregrine falcon *Falco peregrinus*

This migratory raptor reaches its northern limit in the Qaanaaq region.

Peregrine seem to be a low density but regular breeding bird in the assessment area. A pair with young was observed on a cliff face close to Moriusaq in 2016, 2017 and 2018. The adults were several times seen heading for Saunders Island, probably to hunt near the large seabird colonies there.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 1,000 – 10,000 pairs (Boertmann 2008).

5.1.10  Gyrfalcon *Falco rusticolus*

This large falcon is a low density breeder throughout Greenland.

One pair of gyrfalcons (white morph) with a large young was observed on a cliff face opposite Manson Island in August 2016. In 2017 and 2018 no sign of breeding was observed at this location, but a single gyrfalcon was observed near Moriusaq in 2018.

**Greenland Red List status:** Near threatened (Den grønlandske rødliste 2018)

**Greenland breeding population:** 500 pairs (Boertmann 2008).
5.1.11 Ringed plover *Charadrius hiaticula*

This wader species breeds throughout Greenland.

It is a common breeder in the Qaanaaq/Thule-area (Vaughan 1988) and probably also in the assessment area, although definite breeding proof is lacking. In August 2016 several small (family?) flocks were observed along the coast of the mainland and on the islands off the coast, including 12 birds on Manson Island. In July and August 2017 at least three pairs of Ringed Plover were seen close to Moriusaq.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 30,000 – 60,000 pairs (Boertmann 2008).

5.1.12 Turnstone *Arenaria interpres*

While this is a widespread high arctic breeder in Greenland, it is probably a scarce breeder in the Qaanaaq/Thule area (Boertmann 1994). The single birds that were observed along the coast of the mainland and on the islands off the coast in August 2016 and late July 2017, were therefore most likely migrants.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 20,000 – 40,000 pairs (Boertmann 2008).

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Figure 11. Young turnstone *Arenaria interpres* on Manson Island in mid-August 2016
5.1.13 Knot *Calidris canutus*

This wader breeds in most of North Greenland but in most parts in rather small numbers (Boertmann 1994). Knot has been found breeding on high grounds north of Thule Air Base (Vaughan 1988). Due to its preference for high ground with dwarf heath for breeding, it seems unlike that the knot breeds within the assessment area.

The flocks of young birds that were observed in late July 2017 and August 2016 were therefore most likely migrants from breeding areas further north. In 2016 this included a flock of 11 birds at the mainland south coast, 6 birds on Three Sister Bees and 20 birds on Manson Islands.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 15,000 – 30,000 pairs (Boertmann 2008).

5.1.14 Sanderling *Calidris alba*

This is a widespread high arctic breeder, although it seems to be scarce in the Qaanaaq/Thule-area (Vaughan 1988, Boertmann 1994). It is possibly a low density breeder in the assessment area, where three young sanderlings were observed on Manson Islands in August 2016.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 25,000 – 50,000 pairs (Boertmann 2008).

Figure 12. Adult sanderling *Calidris alba* in breeding plumage at Qaanaaq in mid-June 2017
5.1.15 Baird’s sandpiper *Calidris bairdii*

This wader is a local high arctic breeder in Greenland (Boertmann 1994), with confirmed breeding from Thule Air Base area (Vaughan 1988) and near Qaanaaq airport in 2016 (pers. obs.).

It is also a likely breeder in the assessment area, as 3-4 juveniles on Three Sisters Bees islands and c. 12 juveniles on Manson Islands were observed in August 2016. These birds could well be young birds from a local breeding population where the adults had left the area at the time of the field survey.

**Greenland Red List status:** Data deficient (Den grønlandske rødliste 2018)

**Greenland breeding population:** unknown (Boertmann 2008).

![Young Baird’s sandpiper *Calidris bairdii* on Three Sister Bees in mid-August 2016](image)

5.1.16 Purple sandpiper *Calidris maritima*

This is a common breeder in southwest Greenland and a scarce breeder in the southern and central parts of the Qaanaaq/Thule area (Boertmann 1994), where they usually breed close to the coast and feed in the intertidal zone (Meltofte *et al.* 1981).
It is also seems to be a rare breeder in the assessment area, as a single breeding pair with three juveniles was recorded in July 2017 in the heathland and fens west of Moriusaq.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 10,000 – 20,000 pairs (Boertmann 2008).

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5.1.17 **Arctic skua Stercorarius parasiticus**

This skua is a widespread breeder in the low arctic in Greenland (Boertmann 1994) and a scarce breeder in the Qaanaaq/Thule area, where breeding has been recorded near Thule Air Base (Vaughan 1988).

Low numbers probably also breed in the assessment area, although definite proof is lacking. In August 2016 several pairs were observed defending territories, including three pairs on the mainland coast, and one pair on Manson Islands. In August 2017, 2-3 birds were observed along the coast in and one on Three Sisters Bees.

**Greenland Red List status:** Least Concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 5,000 – 10,000 pairs (Boertmann 2008).
Figure 15. Arctic skua *Stercorarius parasiticus* near Moriusaq in mid-August 2016

5.1.18 Kittiwake *Rissa tridactyla*

This small gull species breeds in large colonies along the Greenland west coast north to the Qaanaaq region and locally on the east coast. There is a single colony close to the assessment area on the vertical cliffs on Saunders Island, c. 16 km from Moriusaq. Birds from this colony probably forage in the off-shore part of the assessment area during spring, summer and autumn. In August 2016, July-August 2017 and in September 2018 foraging kittiwakes were common over the sea of in the assessment area. Generally, the kittiwakes were observed 1-2 km from the coastline.

**Greenland Red List status:** Vulnerable (Den grønlandske rødliste 2018)

**Greenland breeding population:** 80,000 – 100,000 pairs (Boertmann 2008).

5.1.19 Ivory gull *Pagophila eburnea*

This gull species breeds on the Canadian side of the North Water Polynya and perhaps also on the Greenland side (Boertmann 2008). On migration to and from the breeding sites, it is likely to be a fairly common vagrant, especially close to the edge of land-fast ice and fields of drift ice (Boertmann 1994). Small numbers probably passes the assessment area in spring and autumn, and a single adult was observed resting on an iceberg off Moriusaq on the 23 August 2016.
Figure 16. Kittiwakes *Rissa tridactyla* off the coast at Moriusaq in September 2018

**Greenland Red List status**: Vulnerable (Den grønlandske rødliste 2018)

**Greenland breeding population**: 500 – 1,000 pairs (Boertmann 2008).

### 5.1.20 Thayer’s gull *Larus thayeri*

In Greenland this gull is only known from the Qaanaaq/Thule-area. There are no recent proof of breeding in Greenland are the few birds observed most likely belong to the large Canadian population. A single Thayer’s gull was observed along the coast of the assessment area in August 2016.

**Greenland Red List status**: Data deficient (Den grønlandske rødliste 2018)

**Greenland breeding population**: unknown (Boertmann 2008).

### 5.1.21 Glaucous gull *Larus hyperboreus*

This large gull breeds throughout most of Greenland, only avoiding the northernmost area (Boertmann 1994). Several small to medium sized colonies are known from the Qaanaaq/Thule area (Boertmann and Mosbech 2017).

This is a common breeder in the assessment area, with several small colonies recorded during the field survey in 2016. Four-five pairs with large young’s were observed
on most of the Three Sister Bees islands and on the Manson Islands. In addition, one or two pairs of glaucous gull were breeding on the cliff island off Moriusaq. In addition, flocks of 10-15 non-breeding birds were also common along the coast and at sea.

**Greenland Red List status:** Least concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 300,000 – 500,000 pairs (Boertmann 2008).

### 5.1.22 Arctic tern *Sterna paradisaea*

This tern species breeds in colonies throughout Greenland, typically on small and low islands. The Greenland population is estimated to 65,000 pairs (Egevang & Boertmann 2003). The terns arrive to the breeding grounds in May/early June and leave during August/September. They spend most of the time in coastal water close to the colonies (Boertmann & Mosbech 2017).

Several small colonies are located in the assessment area, including several colonies on islands off the SW coast of Steensby Land (Figure 17). This was confirmed in August 2016 when several island with breeding colonies were surveyed in August 2016.

![Breeding colonies of Arctic tern *Sterna paradisaea* in the Qaanaaq region. The dots represent colonies with 1 – 600 individuals (modified from Boertmann and Mosbech 2017)](image)

During these surveys, two colonies were recorded; one on Manson Island, with c. 75 adults and many large young’s, and another on the cliff island off Moriusaq, where c. 50 adults and several large young’s were observed. There was no sign of breeding terns on the Three Sister Bees islands. Because the field study took place at a time
when the young’s had left the nest it, was not possible to carry out an accurate count of the number of breeding pairs. Estimated number of breeding pairs, based on the number of observed adults, and assuming that a few additional birds were away from the colonies during the counts, are given in Table 2.

<table>
<thead>
<tr>
<th>Site name</th>
<th>Estimated number of pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manson Island A</td>
<td>40</td>
</tr>
<tr>
<td>Cliff island off Moriusaq</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 2. Estimated number of nesting Arctic terns *Sterna paradisaea* (pairs) in the assessment area in 2016.

The adult terns were observed foraging mainly within a distance of a few kilometres from the colonies. Further away from the colonies, terns were rarely observed during the field survey.

**Greenland Red List status:** Near threatened (Den grønlandske rødliste 2018)

**Greenland breeding population:** at least 65,000 pairs (Boertmann 2008).

5.1.23 Thick-billed murre *Uria lomvia*

This is one of the most numerous seabirds in Northwest Greenland, with a very large part breeding in colonies on the coasts of NOW (Merkel *et al.* 2014). The murres breeding in Northwest Greenland are migratory, wintering primarily at Newfoundland (Boertmann and Mosbech 2017).

This auk species is not breeding inside the assessment area, but a large colony is located on Saunders Island where between 38,000 and 80,000 pairs are breeding on the south and east side of the island (Boertmann and Mosbech 2017). Data from thick-billed murres tagged with GPS data loggers while commuting between the colony at Saunders Island and foraging areas suggests that foraging mainly takes place 30-40 km to the west and south west of the colony (Boertmann and Mosbech 2017).

During field work in the assessment area in late July-September 2016-2018, small groups of thick-billed murres were commonly observed offshore between the coastline of the assessment area and Saunders Island. By far the majority was observed more than 1 km from the shore.

**Greenland Red List status:** Vulnerable (Den grønlandske rødliste 2018)

**Greenland breeding population** in 1994: 360,000 pairs (Boertmann 2008).
5.1.24 Black guillemot *Cepphus grylle*

The black guillemot breeds along nearly all ice free coasts in Greenland. It nests in caves and cracks in cliffs or below rocks in screes and feed on fish and large invertebrates. In the breeding area, the guillemots forage in the coastal zone, and during migration and in the winter they also occur far offshore usually associated with ice.

Three colonies each numbering around 50 pairs are found in the assessment area: one the Three Sisters Bees, one on Manson Island and on one the cliff island off Moriusaq.

**Greenland Red List status:** Least concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 25,000 – 100,000 pairs (Boertmann 2008).

![Figure 18. Black guillemots *Cepphus grylle* at sea off Moriusaq in mid-August 2016](image)

5.1.25 Little auk *Alle alle*

More than 75% of the world population of this small auk – some 33 million pairs - breeds on the Greenland side of the North Water Polynya (NOW)(Boertmann & Mosbech 2017). The colonies nearest the assessment area are shown in Figure 19.
The many little auks feed on the bloom of zooplankton associated with the NOW. Their main feeding areas are in the NOW close to the Greenland coast, as satellite tracking has shown that birds sometimes flew up to 100 km away from the colony (Boertmann & Mosbech 2017).

When the little auks leave the colony after the breeding season, the chicks fly away over the sea accompanied by the male parent (Boertmann and Mosbech 2017). Tagging of little auks with geolocators have shown, that when the birds leave the colony in first half of august, a southwest migration takes place in the western Canadian part of the Baffin Bay and the main wintering areas were offshore Newfoundland (Boertmann and Mosbech 2017).

Because foraging during the breeding almost exclusively takes place in the NOW west of the colonies, little auks are only rarely observed in the assessment area. Also, the migration in autumn is to the southwest and during the field work between late July and September, only very few little auks were observed.

**Greenland Red List status:** Least concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** 33 million (Boertmann 2008).
5.1.26  **Raven *Corvus corax***

Ravens occur in most of Greenland, only missing in the far north. A single (family) flock of four ravens was observed at Moriusaq in 2016-2018. The ravens probably nested in the mountains in the assessment but definite proof lacks.

**Greenland Red List status:** Least concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** unknown but probably no more than 50,000 pairs (Boertmann 2008).

5.1.27  **Wheatear *Oenanthe oenanthe***

Wheatear breeds throughout most of Greenland, but the assessment area represents the northern limit of its breeding range.

During fieldwork in August 2016-2018 a few birds were observed along the coast of the mainland, but with no definite proof of breeding. There are, however, several breeding records from Thule Air Base (Vaughan 1988).

**Greenland Red List status:** Least concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** unknown, maybe up to 500,000 pairs (Boertmann 2008).

5.1.28  **Lapland bunting *Calcarius lapponicus***

This bunting species breeds throughout most of Greenland, but becomes progressively less common in the north.

During field work in 2016-2018, Lapland bunting was found to be a low density breeder along the coast of the assessment area, mainly occurring in areas with dense grass or dwarf heath. There are several breeding records from Thule Air Base (Vaughan 1988).

**Greenland Red List status:** Least concern (Den grønlandske rødliste 2018)

**Greenland breeding population:** unknown, but probably less than 1 million pairs (Boertmann 2008).
5.1.29 Snow bunting *Plectrophenax nivalis*

The Snow bunting breeds throughout Greenland, but the density of breeding pairs is relatively low in the north.

During field work in 2016-2018, flocks of up to 45 birds (young’s and adults) were present at Moriusaq. This was probably a mix of local breeders and pre-migrants from the district.

**Greenland Red List status**: Least concern (Den grønlandske rødliste 2018)

**Greenland breeding population**: unknown, but probably no more than 1.5 million pairs (Boertmann 2008).

5.1.30 Arctic redpoll *Acanthis hornemanni*

The Arctic redpoll is a widespread and not very common breeding bird in the high arctic of Greenland, in north and east Greenland. This includes the assessment area where a family group of five birds were observed in August 2017 in the eastern part of the license area.

**Greenland Red List status**: Least concern (Den grønlandske rødliste 2018)

**Greenland breeding population**: unknown, but probably no more than 10,000 pairs (Boertmann 2008).
6 FISH

During the field work in the assessment area in 2016-2018, no fish were recorded from streams or lakes in the assessment area.

In connection with baseline studies the following marine fish species were recorded:

- **Shorthorn sculpin, *Myxocephalus scorpius***
  Common along the coast of the assessment area and off the north coast of Saunders Island, in areas with stones or rocky bottoms.

- **Greenland cod (Uvak), *Gadus ogac***
  Several caught in areas with rocky bottom along the coast of the assessment area and off the northern coast of Saunders Island.

- **Polar cod, *Boreogadus saida***
  A few were caught in areas with rocky bottom along the coast of the assessment area.

None of the fish known from the assessment area are on the Greenland Red-list of threatened species (Den grønlandske rødliste 2018).
7 VASCULAR PLANTS

The vascular plant flora of the assessment area can broadly be divided into the following main plant communities:

1. Dwarf-shrub heath
2. Stream surrounding
3. River beds
4. Fens
5. Fell-fields
6. Snow beds
7. Fresh water lakes

So far, 102 vascular plant species have been recorded from the plant communities in the assessment area. Most of these are reported by Bay (1992) Orbicon 2018, who visited the area in 1988. During Orbicon field surveys in 2016 and 2017, a total of 70 plant species were recorded.

The distribution of the main plant communities in the assessment area is shown in Figure 20. Below are brief descriptions of each of these plant communities, with the dominating species in the assessment area listed.

![Figure 20. Distribution of main plant communities within the assessment area](image)
7.1.1 Dwarf-shrub heath

The most widespread vegetation on the coastal plains of the assessment area is a high arctic dwarf-shrub heath dominated by *Cassiope tetragona*, *Salix arctica*, *Dryas integrifolia* and *Carex bigelowii* (Figure 20). Other common plants in the dwarf-shrub heath are *Polygonum aviculare*, *Carex bigelowii*, *Vaccinium uliginosum*, *Papaver radicatum*, *Emetrum nigrum* *Silene acaulis*. More scattered are *Salix herbacea*, *Saxifraga oppositifolia*, *Eriophorum triste*, *Luzula confusa*, *Epilobium latifolium*, *Huperzia selago*, *Oxyria digyna*, *Luzula nivalis* and *Armeria maritima*.

Figure 21. *Cassiope tetragona* is a common plant in the dwarf-shrub heath

7.1.2 Stream surrounding

A species rich flora is usually found along the many small streams that runs through the otherwise dry heathland. These streams originate from fens and snow beds along the foot hills of the mountains. The common plants include *Pedicularis hirsuta*, *Saxifraga oppositifolia*, *Saxifraga tricuspidata*, *Pyrola grandiflora*, *Eriophorum triste*, *Oxyria digyna*, *Salix herbacea* and *Vaccinium uliginosum*.
Figure 22. Example of herb rich area along a small stream west of Moriusaq in August 2017

Figure 23. *Pyrola grandifolia* is common along smaller streams and in snow beds
7.1.3 River beds

In addition to the small streams, two larger glacial rivers crosses the assessment area. The largest of these is the Iterlak River in the central part of the area (Figure 24). Only few plant species grow along the rivers, including *Oxyria digyna*, *Braya purpurascens*, *Luzula nivalis* and *Saxifraga tricuspidata*.

![Figure 24. The large river bed of Iterlak River is almost without vegetation](image1)

![Figure 25. *Oxyria digyna* is typically growing on disturbed soil in riverbed.](image2)
7.1.4  Fell-fields

Wind-swept sand and gravel plains with no or very little permanent snow cover during winter also cover large areas of the coastal plains (and the low mountains further inland) of the assessment area. Only few plant species occur on these dry fell-fields. The most common species of plants include Salix arctica, Dryas integrifolia and Festuca brachyphylla. Other common species are Papaver radicatum, Epilobium latifolium and Saxifraga oppositifolia.

![Arctic poppy Papaver radicatum in fell-field](image)

7.1.5  Fens

Fens and bogs also cover large parts of the coastal plains. These plant communities are dominated by grasses, sedges and cotton-grass such as Eriophorum triste, E. scheuchzeri, Carex bigelowii, and Luzula confusa (Figure 27) mixed with Dryas integrifolia, Pedicularis hirsute, Cassiope tetragona, Salix herbacea, Alopecurus alpinus, Eriophorum scheuchzeri, Salix arctica, Oxyria digyna, Polygonum aviculare, Epetrum nigrum, Pyrola grandiflora, Ranunculus hyperboreus, Papaver radicatum, Vaccinium uliginosum, Saxifraga tricuspidata, Equisetum arvense, Tofieldia pusilla, Juncus biglumis,
Figure 27. Fen with Scheuchzer’s cottongrass *Eriophorum scheuchzeri*

Figure 28. Two species of *Pedicularis* are found in the fens, here *Pedicularis flammea*
7.1.6 Snow beds

Snow bed vegetation occurs in depressions where snow accumulates in winter, resulting in a long-lasting snow cover and a short growing season. This is not a widespread plant community in the assessment area, as it is mainly found in a few places where streams have eroded rills close to the coast.

Common vascular plants in snow beds in the assessment area include *Salix herbacea*, *Oxyria digyna* and *Potentilla hyparctica*.

![Figure 29. Typical snow bed in August 2017](Image)

7.1.7 Fresh water lakes

The assessment area includes 8-10 freshwater lakes. These are all shallow, hardly more than 1 or 2 meter deep. The lakes are mostly without submerse or floating vegetation, but in most of the lakes *Hippuris vulgaris* are found along the shores.
7.1.8 Red-listed plants

Among the vascular plants recorded from the assessment area only Fisher's tundra grass (*Dupontia fisheri*) is on the Greenland Red-list of threatened species, where it is listed vulnerable (Den grønlandske rødliste 2018).

Fisher’s tundra grass was not recorded during the field work in 2016-2018 but was sampled in 1988 by Bay (1992). In Greenland Fisher's tundra grass is the only known from Moriusaq, two sites near Thule Airbase, Qeqertat (east of Qaanaaq) and Zackenberg in East Greenland (Bay 1992). It has a circumpolar distribution and is widespread and in some places common in Canadian Arctic Archipelago (https://nature.ca/aafloa/data/www/podufi.htm).
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