

# Guide to the Greenlandic Arboretum



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## Trees in Greenland

An arboretum is a collection of trees intended for scientific study. There are many arboreta around the world, but the arboretum in Narsarsuaq is one of only few collections of trees in subarctic areas. Arboreta offer the opportunity to observe a range of different tree species, both for gardening and forestry, but also provide the basis for scientific investigations of the relationship between trees, their growth and functioning. An arboretum provides habitats for organisms that live on trees. Therefore, arboreta may also be used to study animals, fungi and plants that are associated with trees.

The natural flora of Greenland includes only few species of smaller deciduous trees and shrubs. However, fossil finds (including some from under the Greenland Ice Sheet) show that before the Quaternary glaciations began, approximately 2.5 mill. years ago, Greenland had a diverse tree flora with several conifers and angiosperm (broadleaved) species. In the Greenlandic Arboretum, it is evident that many tree species can survive in the current climate, and it has been suggested that the primary cause of today's limited tree diversity in Greenland is the long distance to forested areas in North America and Europe that limits the spreading of tree seeds to Greenland.

Attempts to plant trees close to Narsarsuaq started more than 100 years ago. The first were the "Rosenvinge's trees" that were sown in 1893 at the fiord, a few kilometers north of Narsarsuaq. A couple of these trees are still alive. In the 1950s and 1960s a plantation called Qanassiassat was established nearby, and despite a difficult start it clearly showed that different conifers could grow in Southern Greenland. This encouraged the early tree planters who in the 1970s initiated larger plantations in Narsarsuaq – which would later become a part of the Greenlandic Arboretum.

The first trees known to be planted in Narsarsuaq were established in 1966 and make up a small group of Siberian larch (*Larix sibirica*)

that can still be seen on the plain northeast of the runway. As of 1976, Søren Ødum from the arboretum in Hørsholm (Denmark) initiated larger planting activities and planted trees collected from the Rocky Mountains and Alaska (among others). Part of this collection was at the same time planted at the Nuuk Fiord and close to Kangerlussuaq Airport. As the plantings at Narsarsuaq developed, the idea of creating a tree collection – an arboretum – emerged, and in the summer of 2004 Kalaallit Nunaata Orpiuteqarfia was inaugurated.

## The Arboretum

The trees of the Greenlandic Arboretum were established over a period of more than 40 years. During this period, the trees have been exposed to cold and dry summers, powerful storms and large variations in temperature during the winter. Several species display clear problems of acclimating to the climate, and many are damaged or dead. Except for Siberian larch and Siberian pine, the most robust species originate from mountainous areas in western North America exposed to foehn winds like those in Narsarsuaq. Trees from more continental origins have often proved less viable. Norway spruce and Scots pine from Scandinavia were the first species to be tested in South Greenland but are deemed as a poor match for the region. Even though the future climate of Greenland is likely to get warmer, it will remain a marginal area for many species.

The Arboretum covers 150 ha (1.5 km<sup>2</sup>) around the Suuluqqap Qaqqaa (Signal Hill), in the valleys northeast of it and on the plain. The areas around the Suuluqqap Qaqqaa (Signal Hill) were the first to be planted. More than 130,000 trees of over 200 species from 600 origins have been planted since 1976. We do not know exactly how many species are still alive, but since 2013 we have registered living individuals from more than 50 different species. The footpath takes you through the oldest part of the arboretum and this guide tells you about some of the species that you will pass along the way.



*Salix glauca*



*Larix laricina*

# A Tour of the Arboretum

The map shows a proposed route with examples of places (marked by numbers), which you can explore. The text below provides information about some of the trees you pass on the way.

## 1 Larches

Larches can be found everywhere in the arboretum. Some species have been planted in small groups for testing purposes, while a large number of the fast-growing Siberian larch (*Larix sibirica*) were planted across much of the arboretum to create shelter for other trees. The big larches to the right of the path were originally part of a grafting trial, and are among the tallest in the arboretum. To the left of the path you will find Tamarack (*L. laricina*) from North America. With its lanky growth, thin branches and light bluish needles it is easy to distinguish from other larches. Throughout the arboretum, you can also find European larch (*L. decidua*), subalpine larch (*L. lyallii*), the alpine hybrid larch (*L. lyallii* × *occidentalis*) and Dahurian larch (*L. gmelinii*).

## 2 Scrub forest

Southern Greenland is approximately at the same latitude as southern Norway, and in Narsarsuaq the climate is sufficiently warm to host scrub forests of downy birch (*Betula pubescens* var. *pumila*). Examples of these can be found along the path. If you know this birch from northern Europe, you may wonder why it has such a low gnarly growth here. This is likely because the trees have formed hybrids with the American dwarf birch (*B. glandulosa*). Another native species seen everywhere is the gray willow (*Salix glauca*). It typically grows up to 2 m tall and is recognized by its white-felted leaves. Yet another native species is the Greenland mountain ash (*Sorbus groenlandica*), but it is mainly found in small groups at protected sites.

## 3 Firs

The arboretum has several species of fir. The most numerous are subalpine fir (*Abies lasiocarpa*) and balsam fir (*A. balsamea*) originating from the Rocky Mountains and the low mountains of eastern North America, respectively. Both species develop well, but during some years the shoots and needles of especially balsam fir get damaged. The reason could be that summers are too short for the shoots to harden properly before the winter, but it is also possible that they dry out in the warm winter foehn storms (nigeq). The dead needles turn red, and as they stay on the trees for several years, damaged trees are easy to spot. If the top shoot dies, new shoots may form, creating trees with many tops ("candelabra trees"). A couple of these can be seen along the path.

## 4 Junipers

Boreal forests are often dominated by coniferous tree species, but they have not spread to Greenland after the last glaciation. The only native conifer found in Greenland is the common juniper (*Juniperus communis* subsp. *alpina*), the range of which reaches 69°N. This species resembles junipers in Europe, but rarely grows to the same height. It rather stays close to the ground or forms low creeping structures across rock surfaces. It grows slowly and can reach ages of more than 200 years.

## 5 Lodge-pole pine

Lodgepole pine (*Pinus contorta*) from northwestern North America is one of the most abundant species in the arboretum and has in some cases shown fast growth. Near the path is a lodgepole pine from Colorado in the US, planted in 1976. Despite the exposed position, it has grown well but the stem split during foehn storms in the

winter of 2018-19. The tree will remain a part of the collection and may survive despite the damage. Along the path, you may encounter several other specimens, but this tree is one of the oldest in the arboretum.

## 6 Douglas fir

The Douglas fir (*Pseudotsuga menziesii*) is also from northwestern North America but is commonly planted in European forests. Although not a timberline species, it can grow at high elevations in the Rocky Mountains and has also been tested in Narsarsuaq. Although the tree was planted on a warm and protected slope and has grown into a relatively large tree with a thick stem, it is obvious that it faces problems. The crown is ruffled, shoots and needles struggle with the dry foehn winds, and most of the living crown is close to the ground, where it is protected by snow in the winter.

## 7 Balsam poplars

Balsam poplars (*P. balsamifera* and *P. trichocarpa*) have been planted in several places around the arboretum, representing different origins and clones. The group to the left is from interior Alaska. Along with some of the conifers, the poplars appear to grow faster than other trees in the Greenlandic Arboretum. In 2021, the tallest trees were measured at 15 m, but near the station commander's house in Narsarsuaq a tree had reached 16 m. As observed in other poplar species, these trees form root suckers. If you take a look in the grass you will find several small poplar trees that may one day develop to become large trees. This phenomenon shows how, in reality, groups of trees can be composed of only one individual.

## 8 White spruce

One of the most commonly planted species in the arboretum is white spruce (*Picea glauca*). It has a large native range across North America. As the climate varies substantially within the range, there are large differences in the performance of white spruce from different origins. Some are healthy and undamaged, even after cold summers or winters with many foehn storms. Others are less tolerant and may also be attacked by aphids, possibly because they have been damaged by climatic events. Attacks by aphids can be recognized by curly shoots and needles, and by the whitish spots consisting of waxy exudates from the aphids. The aphids themselves are tiny.

## 9 11 Engelmanns spruce

Engelmann spruce (*Picea engelmannii*) resembles white spruce and is well adapted to the conditions in the arboretum. It is a mountainous tree and has a wide distribution in the Rocky Mountains from Mexico to Canada. Like Siberian larch, it has been planted in small groups representing different areas of origin, but also in large numbers across the arboretum to create shelter and improve conditions for less robust species.

## 10 Scots pine and Siberian pine

Early attempts to sow trees in South Greenland in the 1890s were made with seed from Northern Scandinavia, and one of the species was Scots pine (*Pinus sylvestris*). At Qanasiassat, in the interior of the fiord, a few trees are now more than 120 years old, but in the arboretum they appear less vigorous. In contrast, Siberian pine (*Pinus sibirica*) from Mongolia appears healthy with no attacks by aphids. It has long soft needles with bright bands, whereas the needles of Scots pine are short and rigid.



*Betula pubescens*



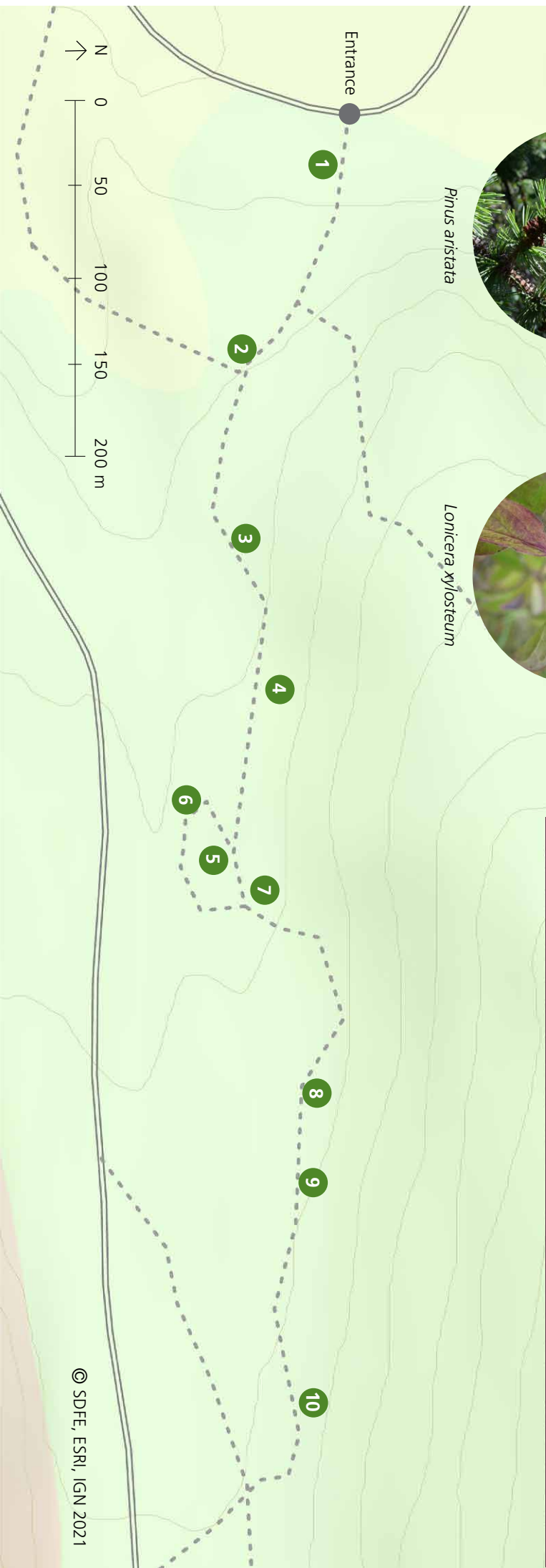
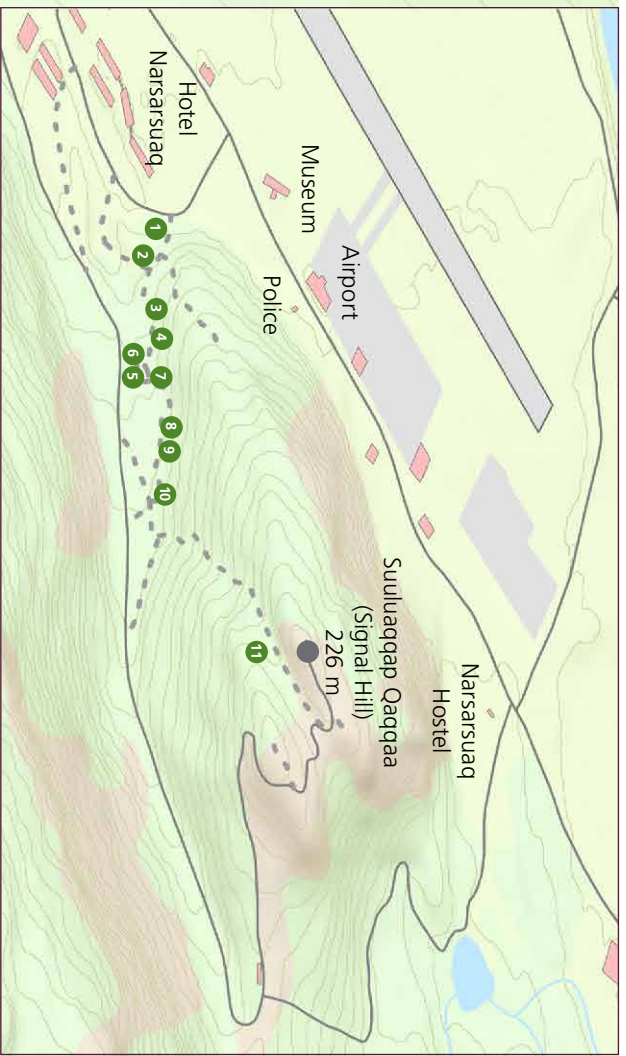
*Pinus aristata*



*Abies balsamea*



*Lonicera xylosteum*



# Welcome to the Greenlandic Arboretum

The Greenlandic Arboretum is located in Narsarsuaq, only a few hundred meters from the airport. Follow the signs to Suuluaqqap Qaqqaa (Signal Hill) and you will be there!

This guide has been developed in collaboration between the Government of Greenland's (Nalakkersuisut) Ministry for Agriculture, Self-Sufficiency, Energy and Environment, and University of Copenhagen, supported by G.B. Hartmann's Familiefond.

The arboretum is a scientific collection, and we kindly ask you not to touch installations or remove branches and trees.

