

Ambassador visual story from the field

Deep Roots in Thawing Permafrost (DROP) at Toolik Field Station



by Vanessa Götz

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Photo © Vanessa Götz

 showing the ancestral grounds of the Iñupiaq people.

POLARLIN supported us with our travels from our Swedish home institution, Umeå University, to the Toolik Field Station.

POLARIN also funded two of our eleven weeks at the station for the two of us – a PhD student at Umeå University and a Master student. After traveling all the way from northern Sweden to Germany, we had a direct flight to Alaska, USA on the 21st of June 2025 that went straight over the Arctic.

This picture shows where Alaska borders on Canada and the Beaufort Sea.

Toolik Field Station

When we arrived at the Toolik Field Station on the 24th of June 2025, Toolik Lake was still partly covered in ice for another week, a reminder of the lingering winter conditions.

However, the seasons change quickly here and this is a reminder of the short snow free period that the Toolik region experiences every year. Some years, the ground is covered up to nine months by snow.

It's amazing that despite such extreme seasonal shifts, the Toolik Field Station celebrated its 50th anniversary this year.



The view of the Brooks Range from the Field Station.

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Tracking responses to Winter and Summer Warming in Arctic Tundra

Our group established a warming experiment in moist acidic tussock tundra in northern Alaska in 2014. Especially winter temperatures have increased in the Arctic over the last few decades. Therefore, [we use snow fences which enhance snow deposition on our research plots to increase winter soil temperatures due to the insulating properties of snow.](#)

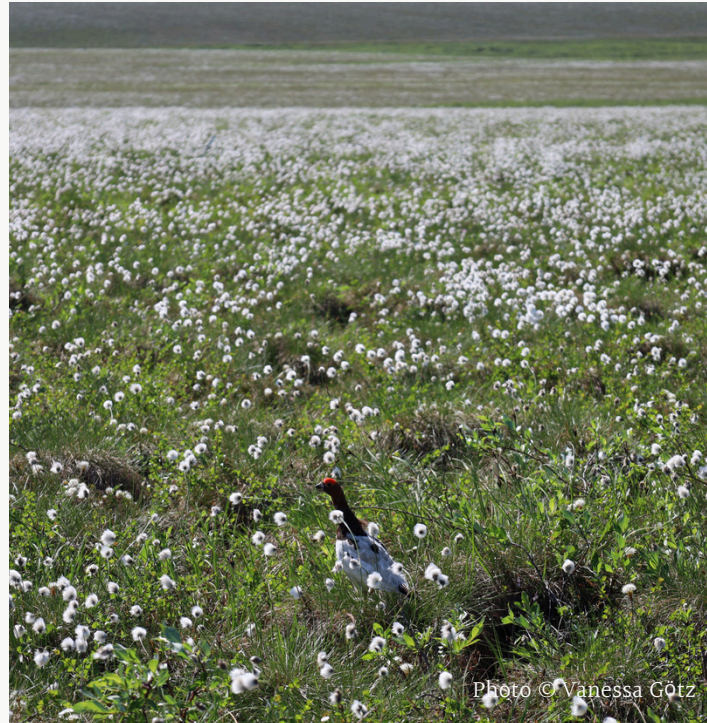
For the simulation of summer air warming we, or rather the incredible supportive Environmental Data Center team at the Toolik Field Station, is setting up open-top chambers (they function like small open greenhouses) each year after snow melt until the end of summer in late August.

We place the chambers in each of the winter warming and ambient plots so that we get treatment combinations of: ambient conditions, only summer warming, winter warming and winter with summer warming. In the picture on the next page, you can see the snow fence posts rising behind an ocean of flowering cottongrass ([Eriophorum vaginatum](#)).



The snow fences themselves are lowered in summer to prevent them from shading the vegetation. [2025 has been a very productive year for cottongrass flowers at our research site.](#)



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One day we had curious visitors checking out our research plots, they were a pair of willow ptarmigans. Later this year we could also spot a small herd of caribous in the valley below our research site.

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In addition to the warming treatment, where we research how the rooting behavior of plants changes with warming, we have set up a plant-removal experiment, where we remove either, deep rooting plants (shown in picture) or shallow rooting plants.

This will help us understand how plant roots change carbon storage in arctic soils, because plant roots can increase or decrease soil organic carbon.

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A close up of the vegetation with small cottongrasses in between lichen, mosses and dwarf shrubs. The plants in this picture already started to show some autumn colours. [It is incredible how many plant, moss and lichen species can already grow on one square meter or less.](#)

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How shallow rooting plants are growing in mats of moss and only partly decomposed plant material above mineral soil.

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Working in the Arctic Tundra

Me doing field work – using the 'point intercept' method – to assess the plant community composition and to later relate our above ground knowledge to below ground processes.

For plant community assessments, we lower pins in a pre-determined pattern and record and count every species that touches these pins. For our comfort, we wear bug shirts while working in the field which keep mosquitos from flying into our faces and biting us all over. Good thing, that you can get quite used to the constant buzzing of a swarm of mosquitoes surrounding you like a blood sucking cloud while wearing one of these shirts.

Meanwhile, the sun has already bleached my bug shirt over several seasons, with no shade in sight under the summer sun in this vast open landscape.




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Fire Far Away, Smoke Up North



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While many know, that forest fire can occur in Alaska, it is astonishing to see, how far north smoke from boreal forests south of the Brooks Range can travel. There were several days this summer, when the Toolik Field Station was under a blanket of smoke, reducing visibility and leaving a haze over the landscape. *It's a stark reminder of how interconnected ecosystems are, while wildfires from hundreds of kilometers away affect the air quality in the Arctic.*



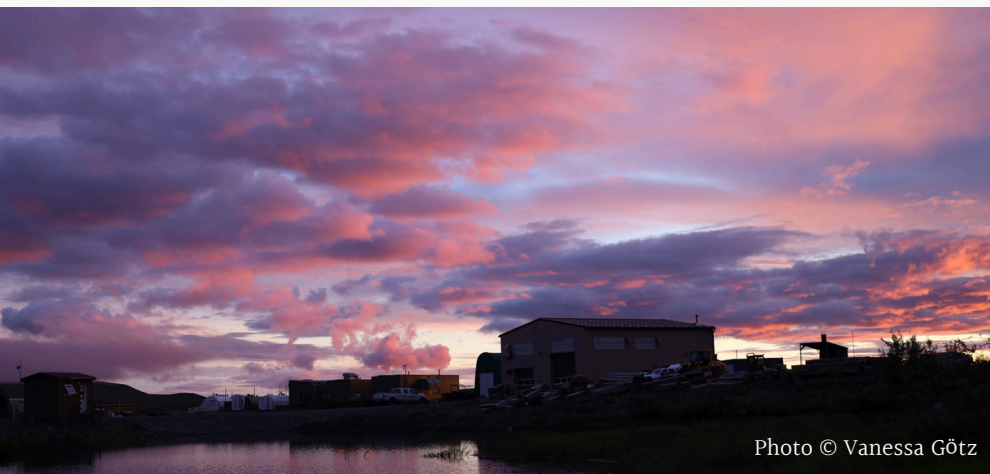
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When the Sun Sets and the Sky Dances

While staying at the Field Station it is so easy for me to get used to 24 hours of daylight so it was a bit sad, when we had to anticipate the setting of the midnight sun.


But this year, the first sunset after 24/7 daylight was one of the prettiest sunsets, I was ever fortunate enough to witness.

In early September, we were also treated with some nice Northern Lights over the camp.



The first sunset after 24/7 daylight.

These pictures were taken around 2 am on July 23rd and show the camp and the Brooks Range covered in all shades of pink.

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This summer, we not only saw lingering signs of winter while Toolik experienced a heat wave in late July, we also saw temperatures drop to freezing point while it started to snow several times over the summer period.



The pictures show Jade Mountain, covered with snow, behind the Toolik Community Centre on July 10th. And Fireweed bent under snow.

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Encounters with Arctic Wildlife

On our almost daily commutes to and from our research site we saw quite many animals. Among others I could take pictures of a Gray Wolf, a Grizzly Bear, Alaskan Marmots, Arctic Ground Squirrels, Yellow-Billed Loons – the kind that is depicted in the logo of the Toolik Field Station, Muskoxen, Common Ravens and Red Fox cubs.

We also saw (incomplete list): Caribous, Willow ptarmigans, Pacific Loons, A Red-Throated Loon, A Bald Eagle, a Rough-Legged Hawk, Sandhill Cranes, a Short-Eared Owl, a Gryfalcon, a Merlin, Lappland Longspurs, White-Crowned Sparrows, and Common Redpolls









Photo © Vanessa Götz

DROP - Deep Roots in Thawing Permafrost



Photo © Emma Andersson

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