



TEACHERS AND RESEARCHERS
EXPLORING AND COLLABORATING

Welcome to *PolarConnect*

with Susan Steiner and the Tundra Nutrient
Seasonality PolarTREC Expedition

Thursday, 7 June 2012

9:00 a.m. AKDT

(10:00 am PDT, 11:00 am MDT, 12:00 pm CDT, 1:00 pm EDT)

Slides will be shown here

Exit the presentation

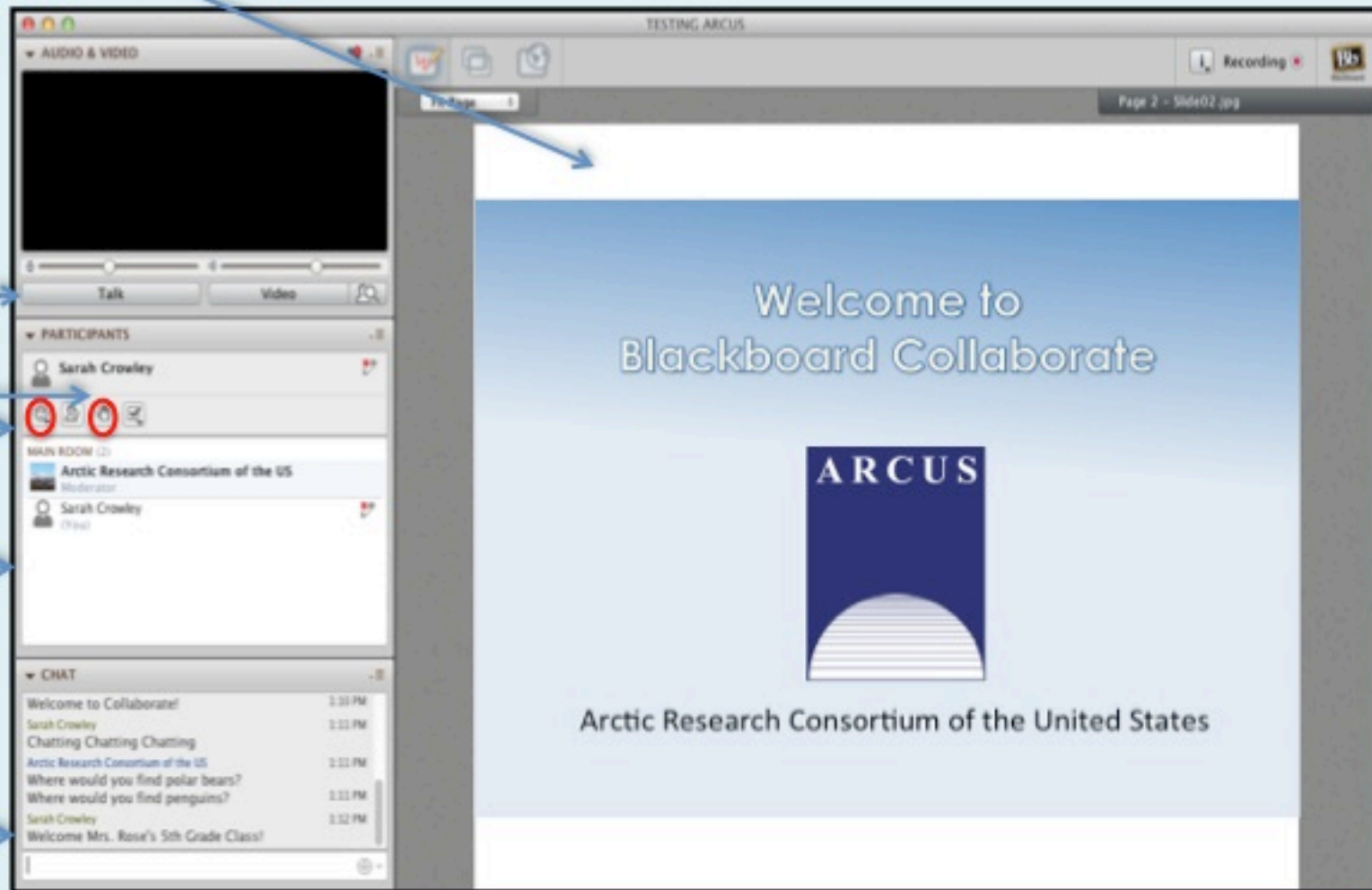
Click to Talk, Unclick to finish talking

Raise your hand to ask a question

Share with emoticons

List of all participants

Chat with one person or the entire group



The screenshot shows the Blackboard Collaborate interface. The main window displays a presentation slide titled "Welcome to Blackboard Collaborate" with the ARCUS logo and the text "Arctic Research Consortium of the United States". The sidebar on the left contains several sections: "AUDIO & VIDEO" with a video player and "Talk" and "Video" buttons; "PARTICIPANTS" with a list of participants including Sarah Crowley and Arctic Research Consortium of the US, and icons for mute, unmute, and hand-raising; "MAIN ROOM" with a list of participants; and "CHAT" with a chat history and an input field. A "Recording" indicator is visible in the top right corner of the main window.

Please Note:

- Participants using the telephone can mute/unmute by **pressing *6** on the phone.
- Today's event will be recorded and archived.

Participant Introductions

Please type in the chat box:

- ✓ Name
- ✓ Affiliation (School, Institution, Etc.)
- ✓ The number of students and adults participating with you in the same location



TEACHERS AND RESEARCHERS
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What is PolarTREC?

PolarTREC is a professional development experience in which K-12 teachers are paired with researchers for 2-6 week research experiences in the polar regions.

From 2010-2013, nearly 50 teachers from around the United States will join scientists in the Arctic and Antarctica to learn about science, the polar regions, and to share what they have learned with their students and communities.

Questions

During the Presentation:

- Type your question in the text chat box

At the End of the Presentation:

- Raise your hand with the “hand button”.
- PolarTREC staff will call on you.
- Speak loud and clear and directly into the phone to ask your question.

Click on the Talk button to speak.

Unclick when you are done.

Welcome to Toolik Field Station!



Where are we?

357 miles (driving)
from Fairbanks, AK

That's 9 hours of
driving the Dalton
Highway!

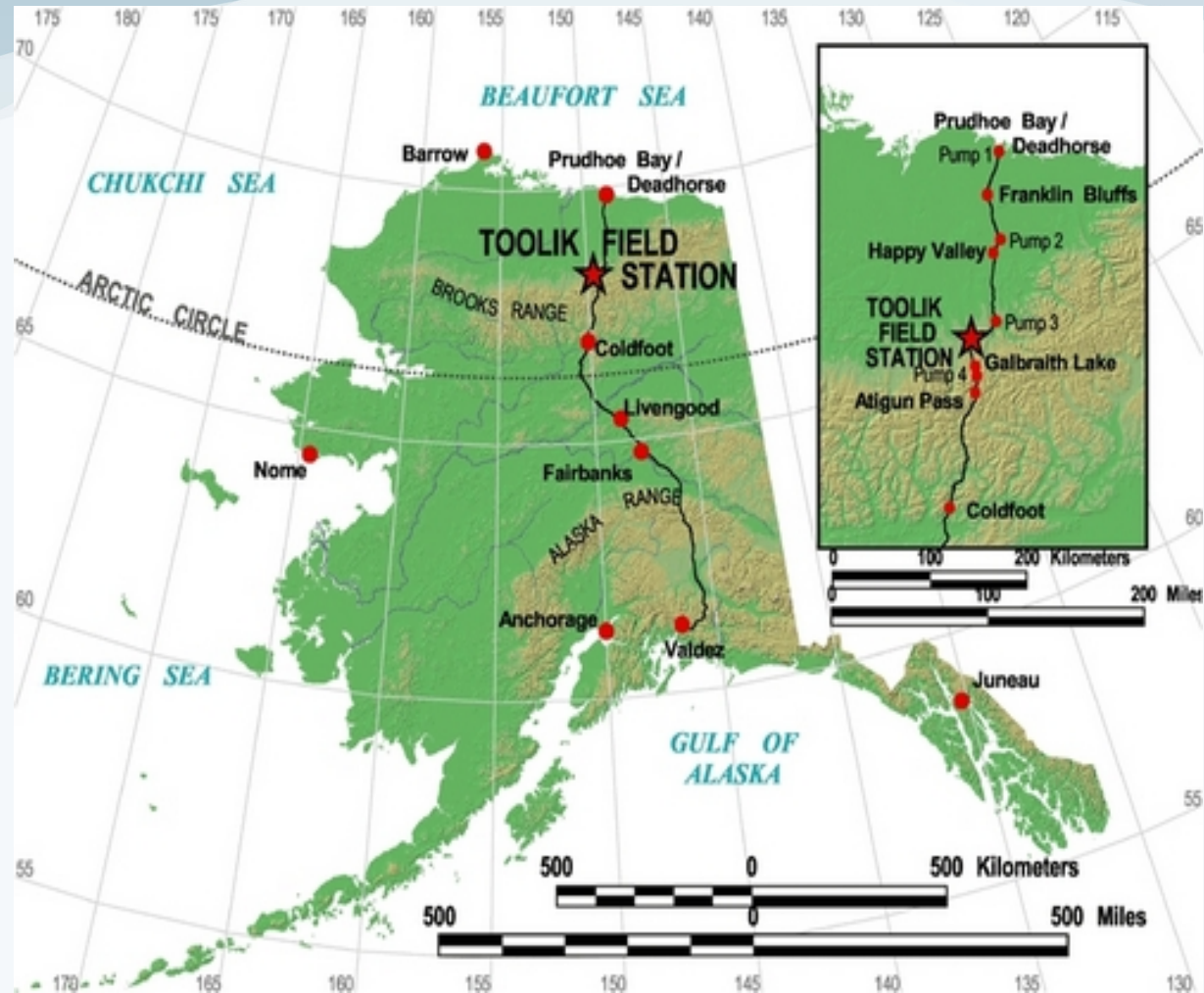
158 miles north of the
Arctic Circle

111 miles south of
Prudhoe Bay

117 miles south of the
Arctic Ocean

Toolik Field Station, About TFS, Fun Facts!

http://mercury.bio.uaf.edu/toolik/about-tfs/index_about-tfs.html





November 27 to January 14 sun never
rises

May 26 to July 17 sun never sets

FUN FACT! We're North of the Arctic circle, and
right now we have 24 hours of daylight!

Who runs the field station?

The Institute of Arctic Biology at the University of Alaska, Fairbanks



Tundra Nutrient Seasonality

Who are the team members?



The Changing Seasonality of Tundra Plant-Soil Interactions

Mike Weintraub - Lead PI, U. Toledo
Heidi Steltzer – PI, Fort Lewis College
Paddy Sullivan – PI, U. Alaska, Anchorage
Josh Schimel – PI, UC Santa Barbara
Ed Rastetter – PI, Marine Biological Labs
Matt Wallenstein – PI, Colorado State U.
Anthony Darrouzet-Nardi, Postdoc, U. Toledo
Aliza Segal, MS Student, U. Alaska, Anchorage
Caroline Melle, MS Student, Colorado State U.
Seeta Sistla, PhD Student, UC Santa Barbara
Sadie Iverson, PhD Student, UC Santa Barbara
Rick Shory, Research Associate, Colorado State
Mallory Ladd, Research Associate, U. Toledo
Travis White, Research Associate, U. Toledo
Carolyn Livensperger, RA, Fort Lewis
Kat Daly, REU, Fort Lewis College
Tiffany Tsosie, REU, Fort Lewis College
Aaron Klingborg, RA U. Alaska, Anchorage



Courtesy of Mike Weintraub

Meet a few team members up close!



Co-PI Dr. Matthew Wallenstein from Colorado State University and Lead PI Dr. Mike Weintraub from the University of Toledo



More Team Members!

Post-doc Anthony Darrouzet-
Nardi, University of Toledo
and Masters student Carolyn
Livensperger, Colorado State
University



Caroline Melle, Master's student from Colorado State University, sorting soil from tussock soil cores



Oops, that sik-sik isn't on the team,
he just lives near our research site!



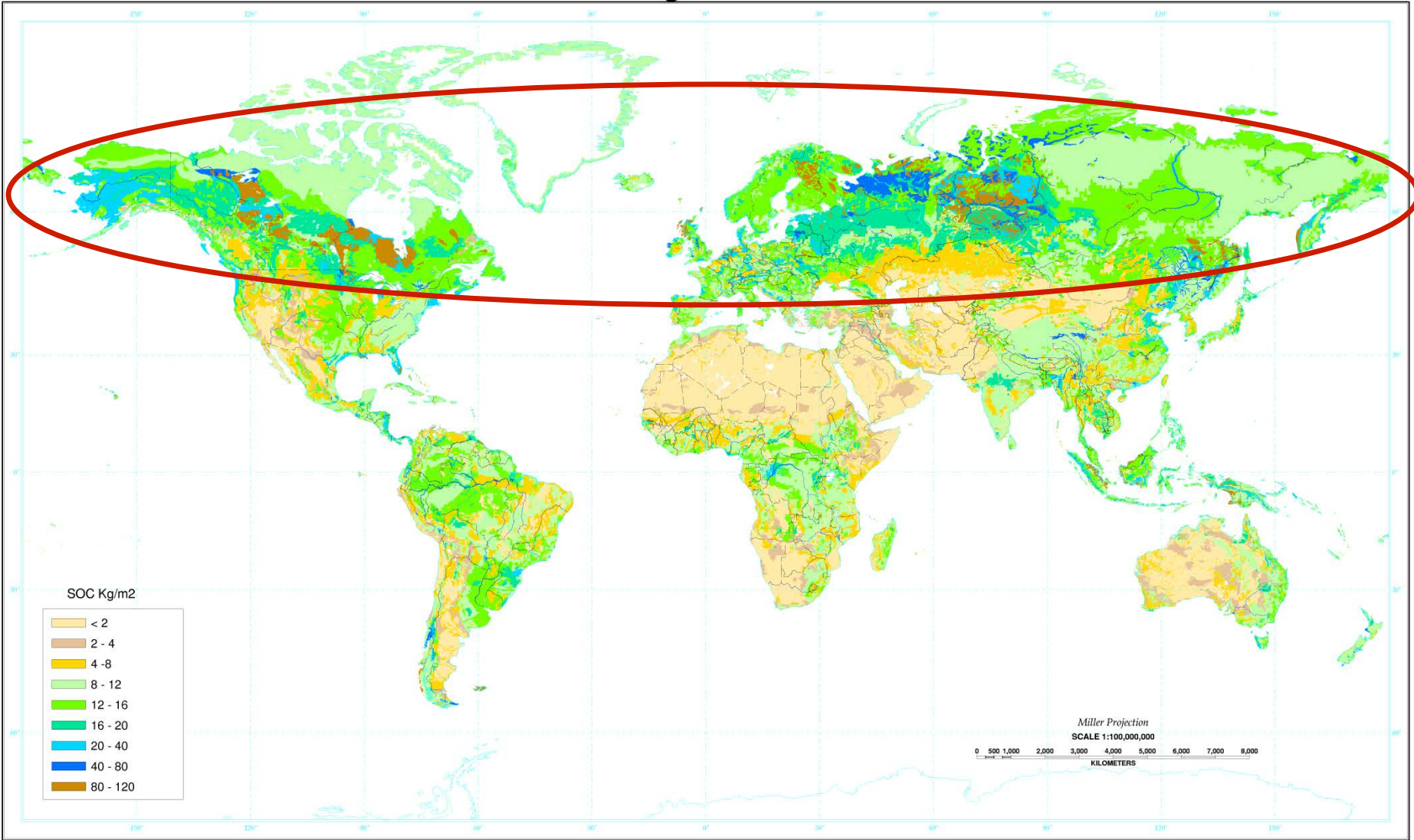
Me collecting micro-lysimeter samples!

WHAT IS OUR RESEARCH ABOUT?

Tundra soils are key regulators of many aspects of the Arctic System.

Arctic soils have large stores of carbon (C) and may act as a significant CO₂ source with warming.

Soil Organic Carbon



Country boundaries are not authoritative.

Washington D.C. 1997

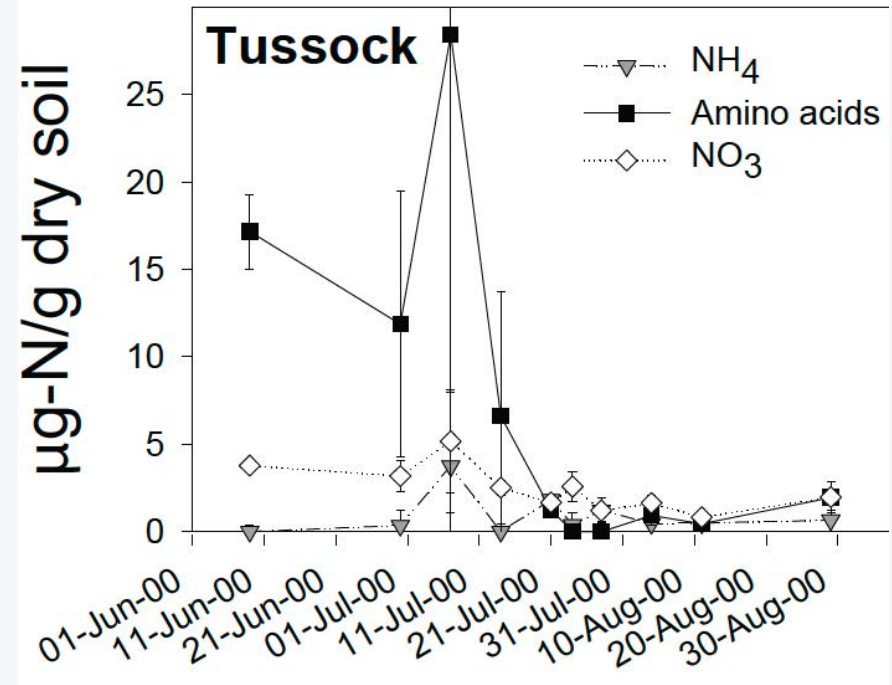
Source: FAO-UNESCO, Soil Map of the World, digitized by ESRI. Soil climate map, USDA-NRCS, Soil Survey Division, World Soil Resources, Washington D.C.

CO₂?



What do we need to know about tundra soil processes?

The key to understanding tundra soil processes is nitrogen (N), because both plant growth and decomposition are controlled by nitrogen availability



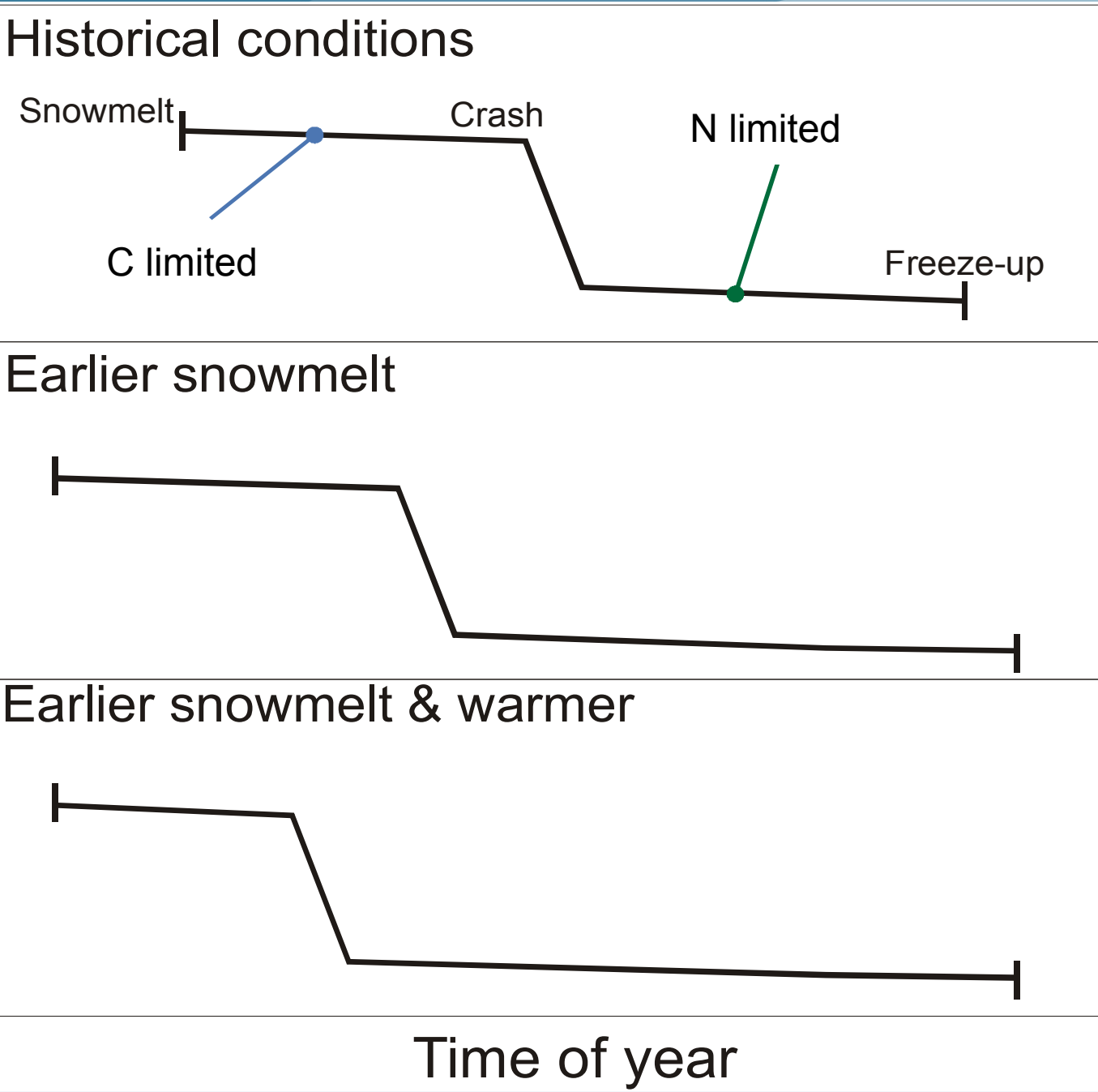
N availability is strongly seasonal with relatively high availability early in the growing season followed by a pronounced crash.

What's a tussock?



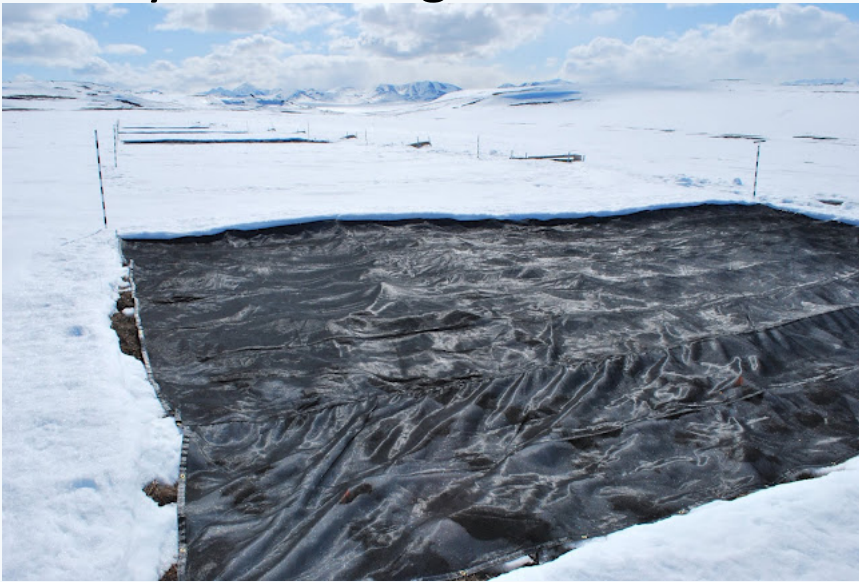
What are our Research Questions?

- 1) What causes the seasonal nutrient crash?
- 2) Microbes are important decomposers, and thus processors of Nitrogen. Does microbial activity switch seasonally between Carbon and Nitrogen limitation?
- 3) How will a lengthening of the growing season alter overall ecosystem Carbon and Nitrogen dynamics, as a result of differential extension of the periods before and after the nutrient crash?



How are we getting answers to these questions?

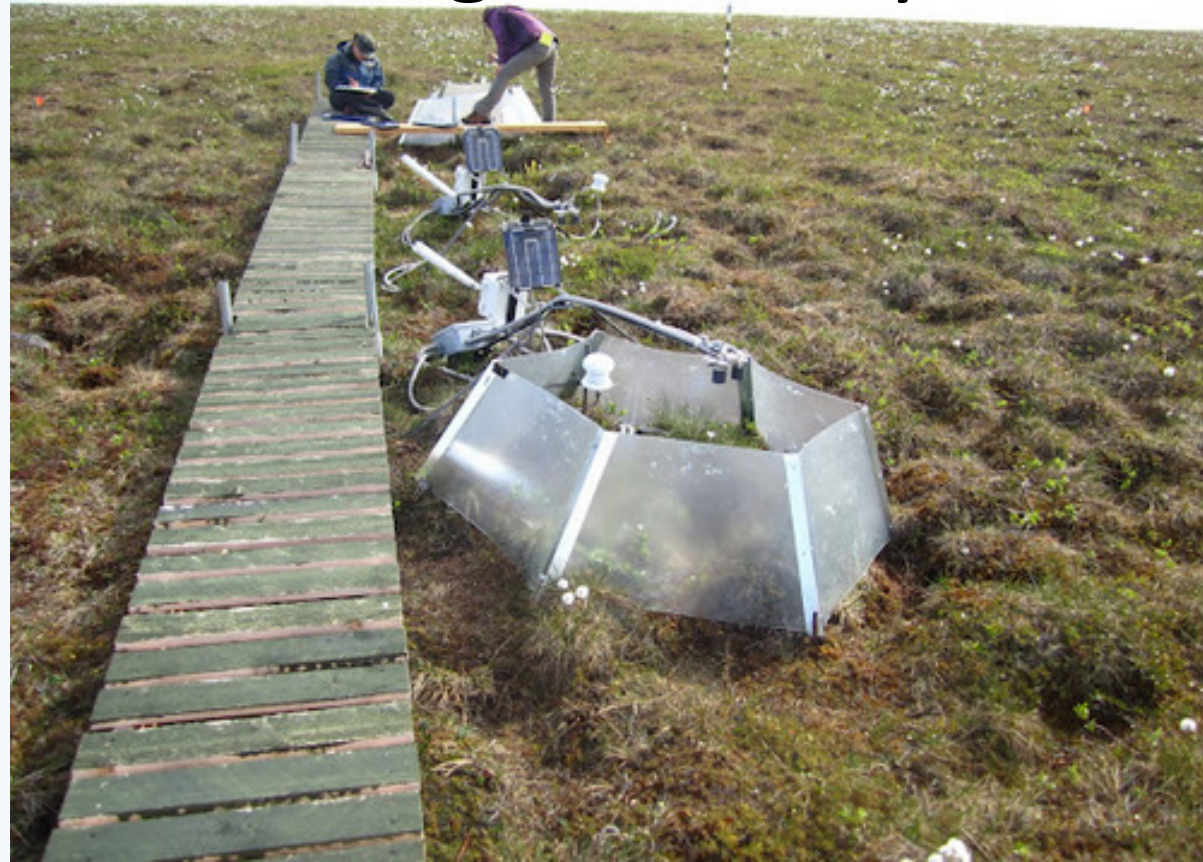
Varying the length and timing of the growing season in the field
by advancing snow melt



Snowmelt Project Folder, photos by Anthony Darrouzet-Nardi
<https://plus.google.com/photos/112217004742857957314/albums/5737002629718470865>

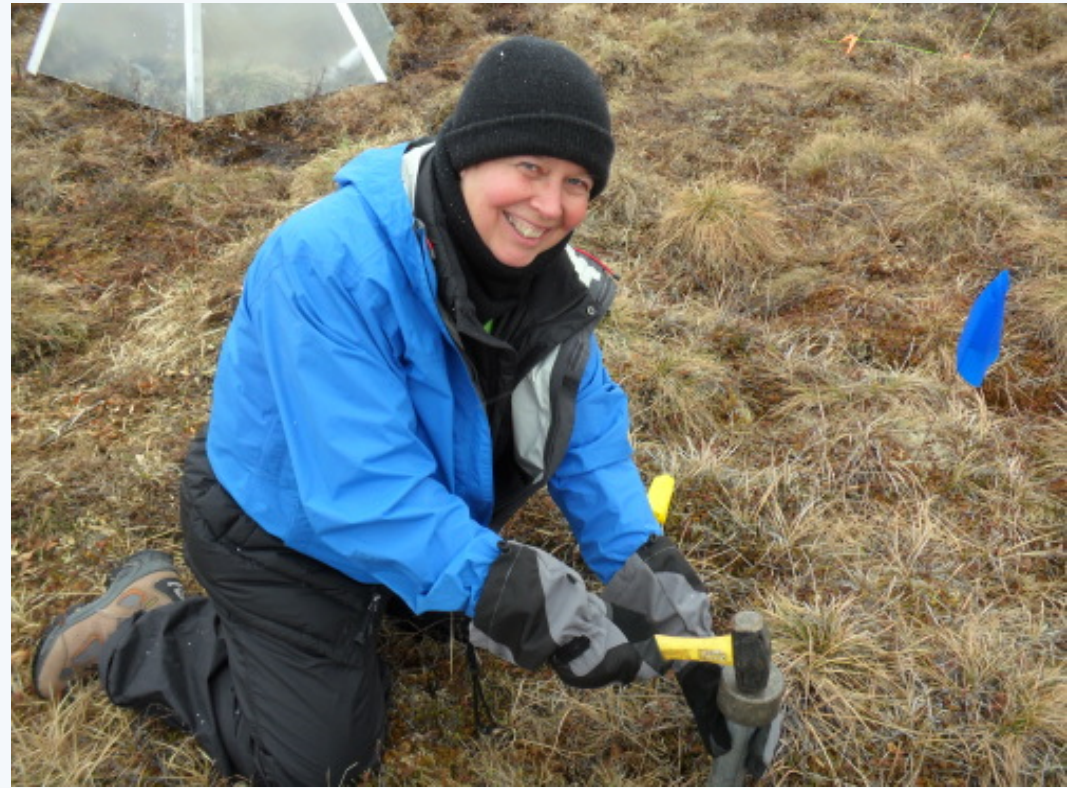
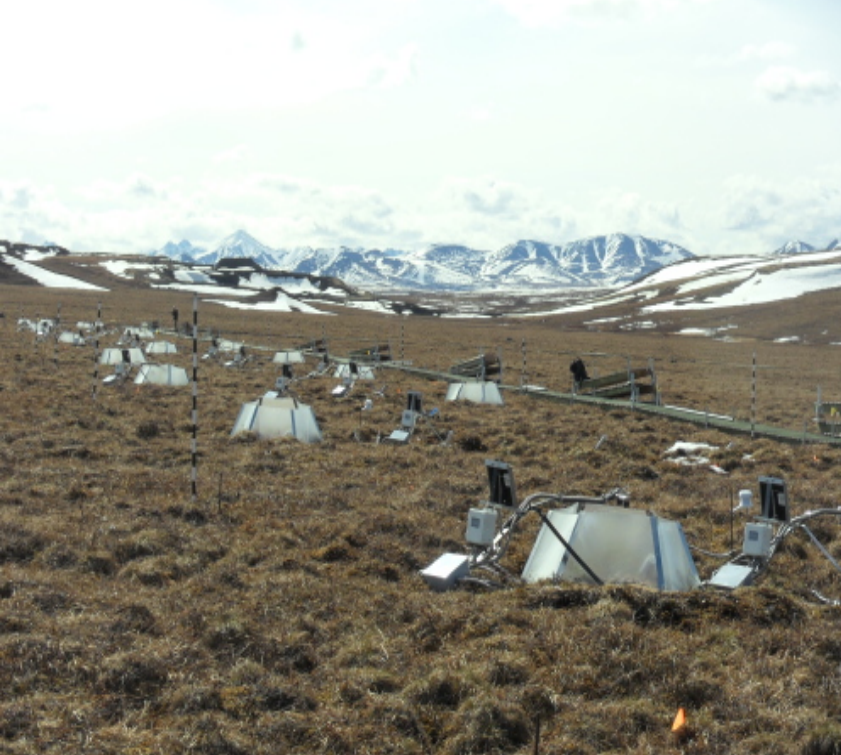
and warming the ecosystem!

Pictured here is a six sided plastic structure called an Open Top Chamber (OTC). These are used to warm a section of tundra in order to study the effects of warming climate



Tussock Tundra

Can you see the overall "bumpiness" of the terrain? On the right you can see our method of sampling soil



Tussock tundra is a grassland tundra made up of tussocks (the bumps) consisting primarily of tussock cottongrass (*Eriophorum vaginatum*) and intertussock space containing mainly mosses, lichens and shrubs

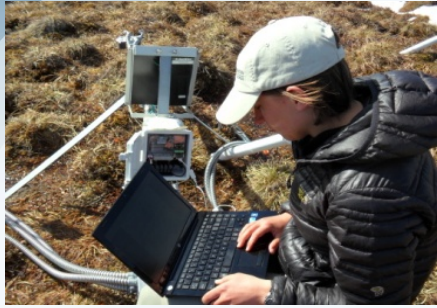
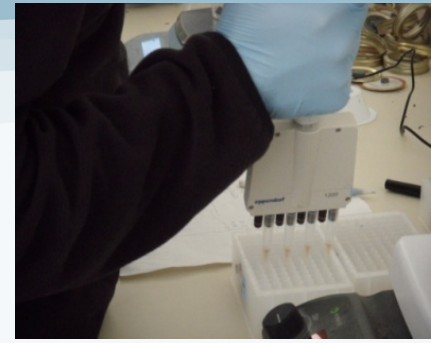
What methods are we using to find answers?

What are we trying to do?

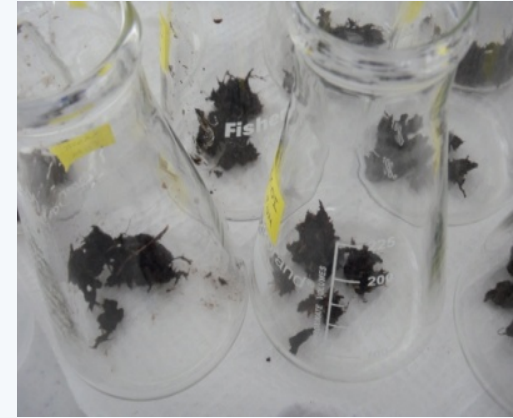
Establish the fine scale seasonal time-courses of soil N availability, plant N content, leaf expansion, root growth, ecosystem respiration, microbial biomass and enzyme activity

How are we trying to do it?

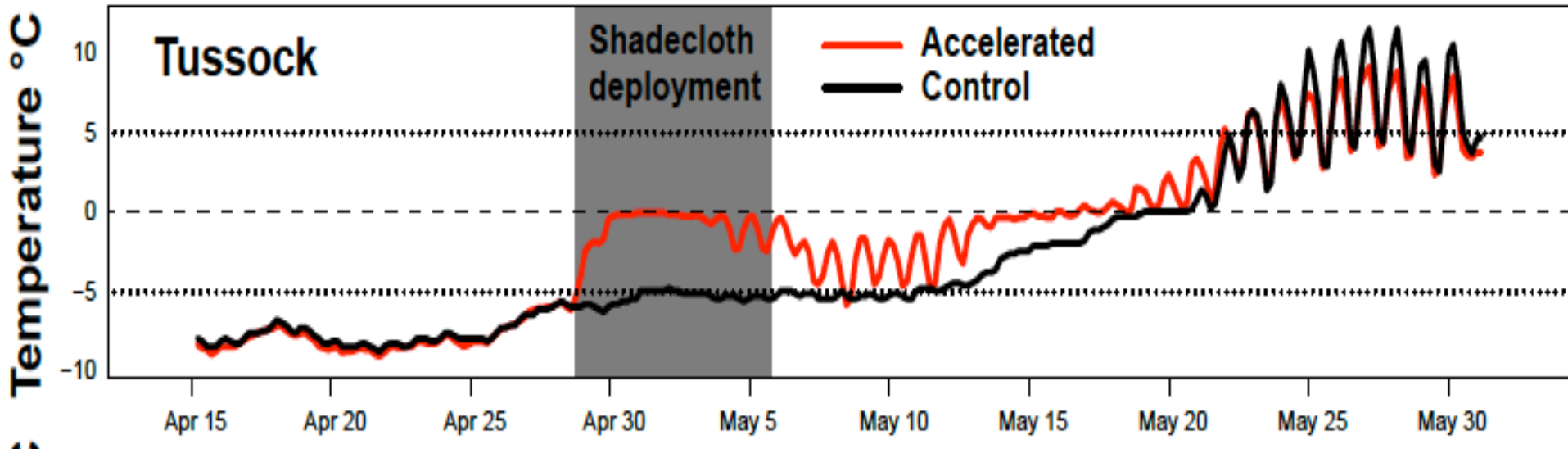
- Soil samples
 - Enzyme assays
 - Microbial biomass
- Microlysimeter samples
- Phenology data
- Rhizotrons
- Respiration chambers
- Tracking Surface greenness



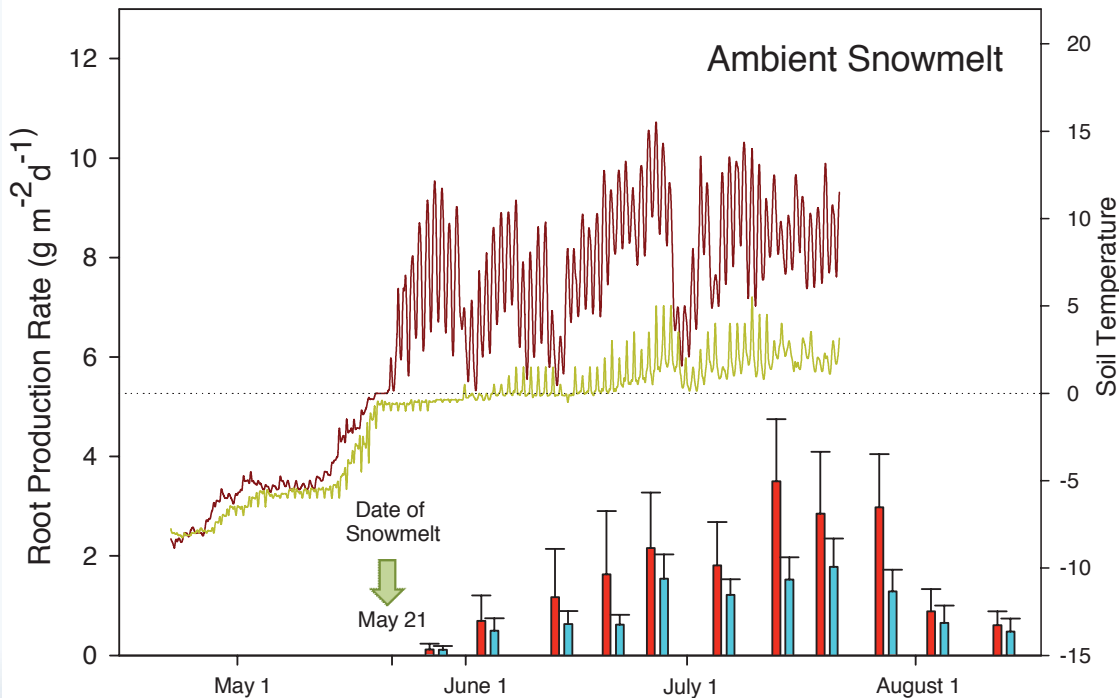
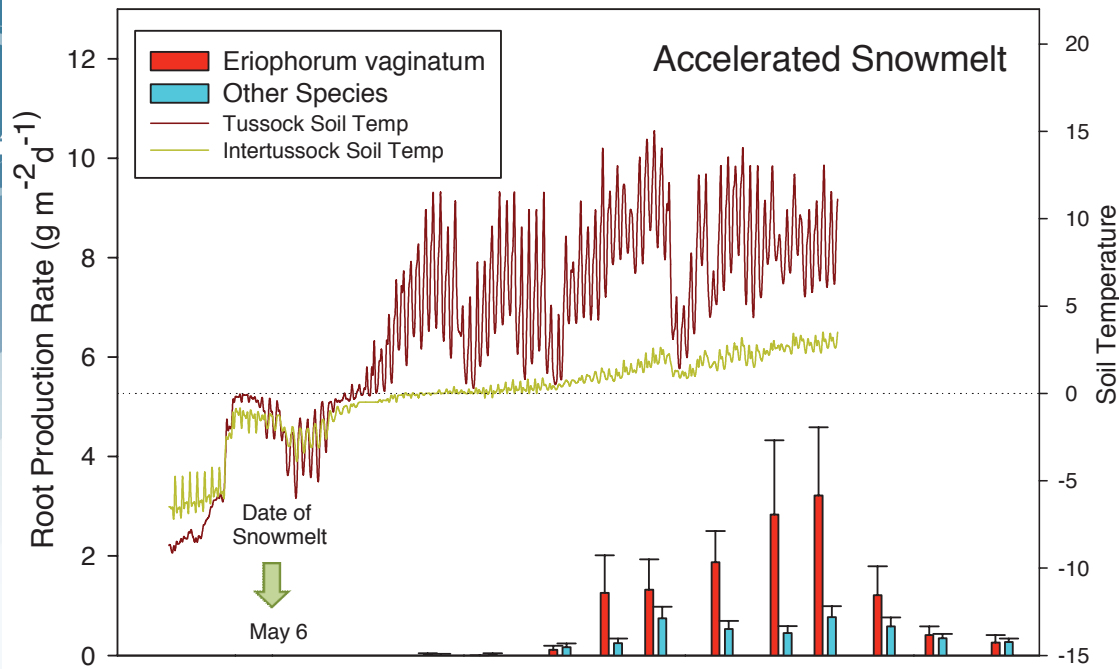
Soil samples
Enzyme assays
Microbial biomass
Microlysimeter samples
Phenology data
Rhizotrons
Respiration chambers
Environmental conditions



What results are being seen?



We accelerated snowmelt by 15 days in
2011



Surprisingly,
root growth
was slower
and root
biomass was
lower in the
accelerated
snowmelt
plots!

Graph courtesy of Aliza
Segal & Paddy Sullivan

What does that finding mean?

- Accelerated snowmelt resulted in delayed and reduced root growth in tussock tundra
- We believe that this is due to low temperature stress because this did not happen when accelerated snowmelt was combined with warming
- Any climate changes that impact root growth are likely to alter nutrient availability, microbial activity, and decomposition rates.

What questions do you
have?



Thanks to ARCUS, PolarTREC, the Institute
Of Arctic Biology and Toolik Field Station and to
Mike Weintraub, researcher extraordinaire!





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Teachers: Join PolarTREC!

www.polartrec.com/about/join

Every teacher can participate in different ways:

- **Following Expeditions**
- **Participate in PolarConnect Events**
- **Join the Polar Education Email List**
- **Take Online Professional Development Courses**
- **Become a PolarTREC Teacher!**



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Upcoming Events

Watch for and register for upcoming events at www.polartrec.com!

Thank You!

An archive of the event will be available shortly.

<http://www.polartrec.com/polar-connect/archive>

