Welcome to Live from IPY!

Behind her protective mask of mosquito netting!

With Cathy Campbell & the Changing Tundra Landscapes Team at Toolik Field Station, Alaska

July 17, 2008

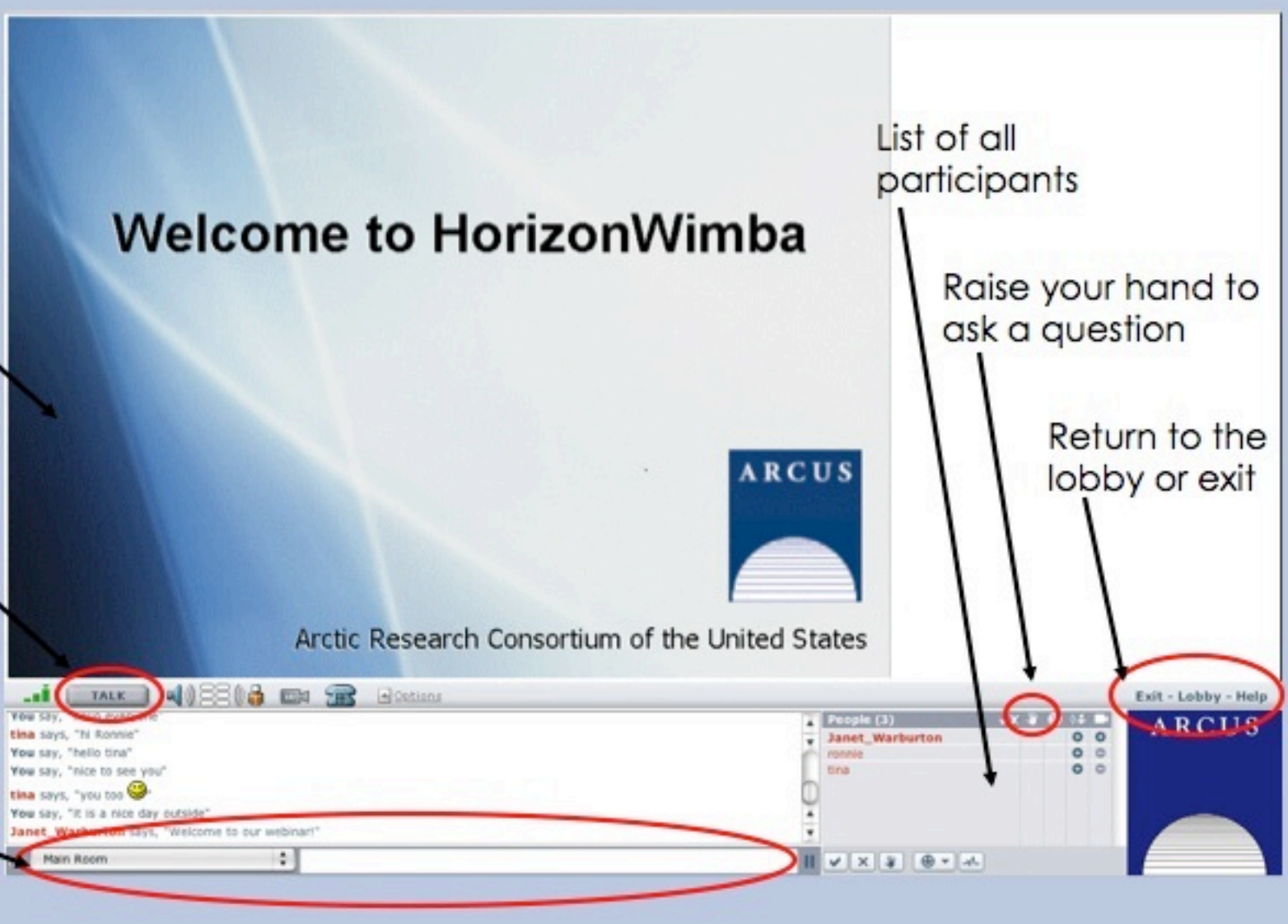
9:00 AM Alaska Daylight Time [7:00 AM HDT, 10:00 AM PDT, 11:00 AM MDT. 12:00 PM CST, 1:00 PM EDT]

Wimba
people teach people

Slides will be shown here

If using VOIP, press here to talk

'Chat' with one person or the entire group



List of all participants

Raise your hand to ask a question

Return to the lobby or exit

Please note: Today's event will be recorded and archived at www.polartrec.com.

What is PolarTREC?

PolarTREC is a professional development experience in which K-12 teachers are paired with researchers in authentic polar research experiences.

In the next three years 36 teachers from around the United States will join scientists in the Arctic and Antarctic in celebration of the International Polar Year!

www.polartrec.com

The PolarTREC Team

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Project Manager

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Web Developer

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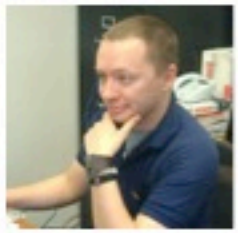
Project Manager



Zeb Polly
Systems Administrator

Joed Polly
Video Production

...with help from the entire staff at ARCUS

Changing Tundra Landscapes
www.polartrec.com

International Polar Year (IPY)

2007-2009

The International Polar Year (2007-2009) is an exciting scientific campaign focusing on the world's polar regions!

IPY is a time for discovery, science, learning, and awareness about the polar regions with activities for youth, scientists, and the public.

www.ipy.org

Where is Ms. Campbell & the Team?

Map courtesy of NASA

Changing Tundra Landscapes

Dates: June 24 - July 26, 2008
Location: Toolik Field Station, Alaska

The team is measuring carbon, water, and energy fluxes at the Toolik Field Station, Alaska. Their results will be compared to findings from other arctic sites in Russia, Sweden, Greenland, and Canada to form a coordinated network of long-term observatories.

They are also investigating how climate warming will affect arctic plant and soil communities both above- and belowground. The team will measure and compare a variety of factors in experimental and control plots in two different kinds of tundra; these data are crucial to understanding the long-term responses of these two communities and to predicting future changes.

Cathy Campbell
PolarTREC Teacher

Scarlett Middle School
Ann Arbor, Michigan

Changing Tundra Landscapes
www.polartrec.com

Who we are talking with today:

Dr. Donie Bret-Harte

University of Alaska Fairbanks

Fairbanks, Alaska

Dr. Laura Gough

University of Texas at Arlington

Arlington, Texas

Dr. John Moore

Natural Resources Ecology Laboratory

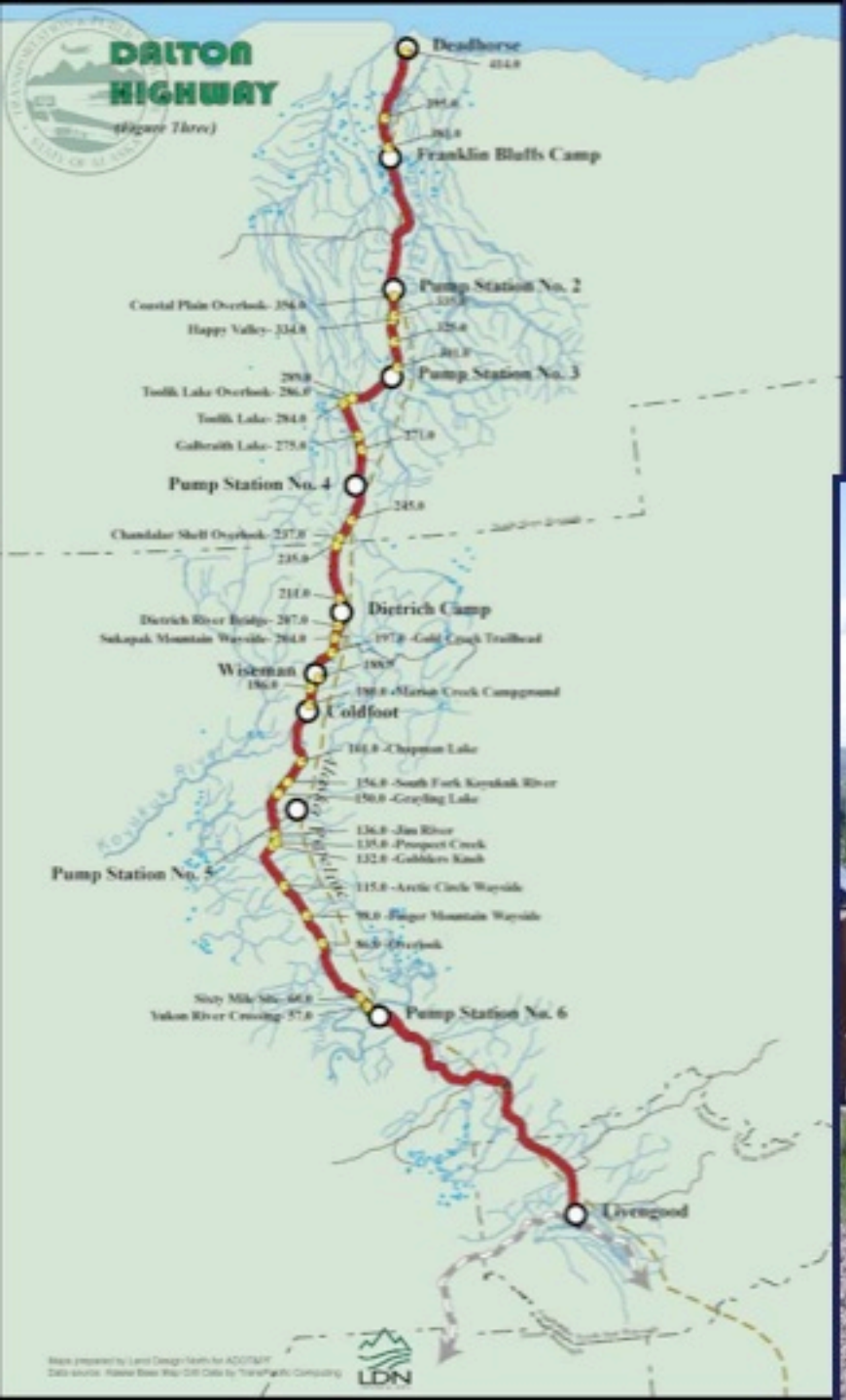
Colorado State University

Fort Collins, Colorado

Newly arrived on the scene

John & Karl already working

Scarlett Middle School in Ann Arbor, MI



It's a long way from Fairbanks to Toolik Lake


Toolik Lake Field Station

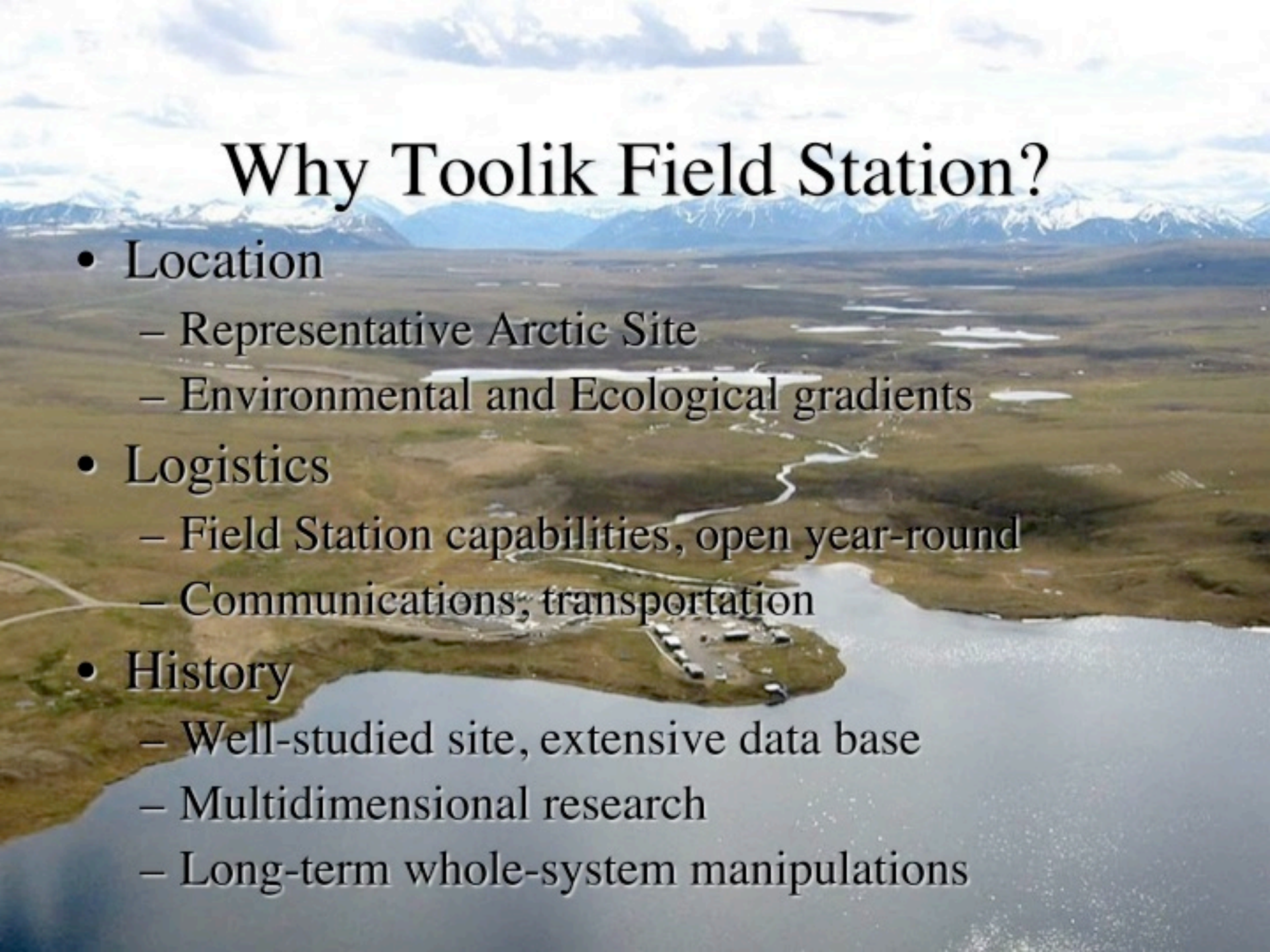
Basic Needs


Inside lab 2


Terrestrial
Fieldwork

Grads, Undergrads and RA's

Toolik Field Station was established in 1975

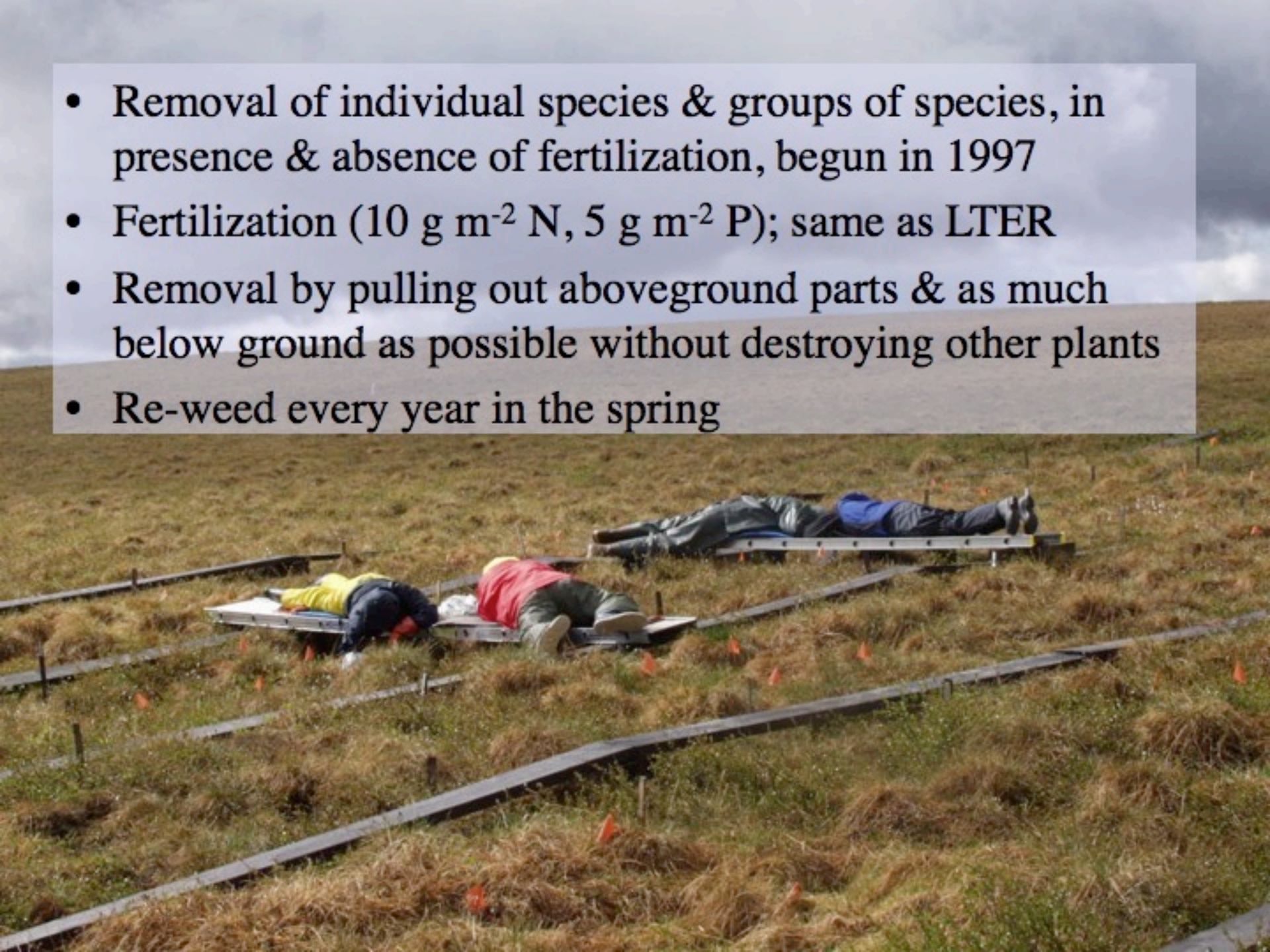


Why Toolik Field Station?

- Location
  - Representative Arctic Site
  - Environmental and Ecological gradients
- Logistics
  - Field Station capabilities, open year-round
  - Communications, transportation
- History
  - Well-studied site, extensive data base
  - Multidimensional research
  - Long-term whole-system manipulations

- What role does plant species composition play in ecosystem response to changing conditions?
  - Does ecosystem capacity to respond depend on which species are present?
  - What are the biogeochemical consequences of changes in plant species composition?
- How does a changing climate affect ecosystem exchange of carbon, water, and energy?

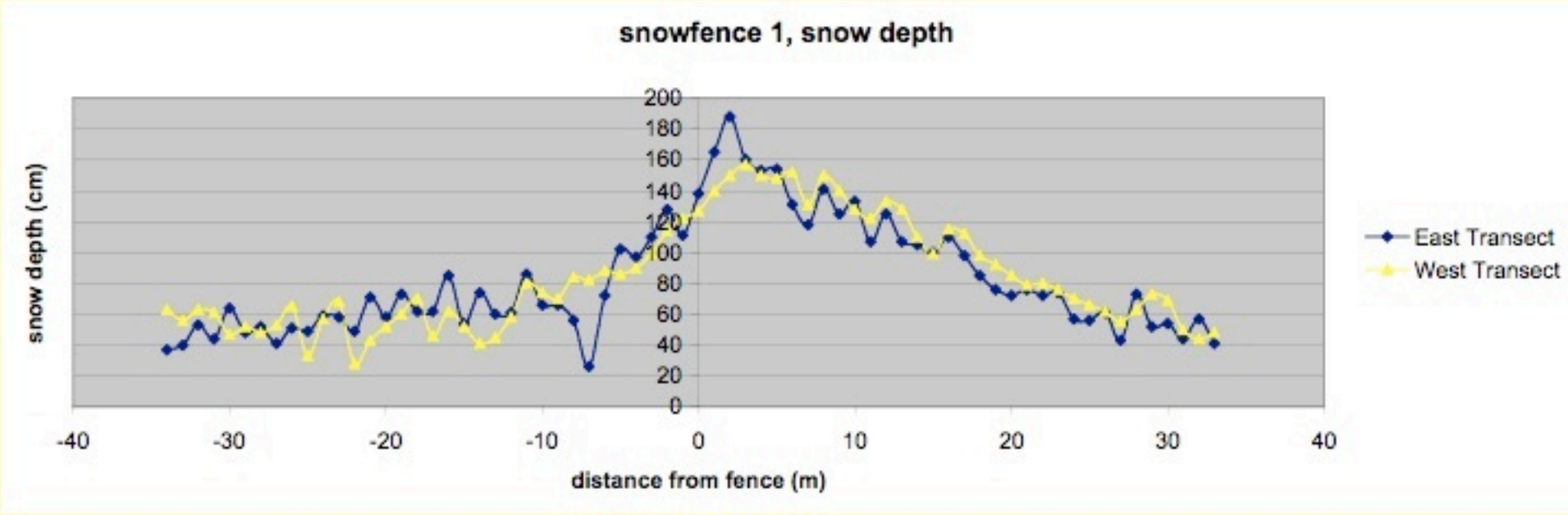
- Removal of individual species & groups of species, in presence & absence of fertilization, begun in 1997
- Fertilization (10 g m^{-2} N, 5 g m^{-2} P); same as LTER
- Removal by pulling out aboveground parts & as much below ground as possible without destroying other plants
- Re-weed every year in the spring



Snow-shrub interactions

- Effects of shrubs on snow → insulate soil, increase winter temperatures, change C & N cycling
- Effect of snow-loading on shrubs
  - Shrubs may lay down under the snow, in which case they must rise up again in the spring
  - Shrubs that stick up above the snow may be subject to winter mortality due to low temperatures, abrasion by wind, herbivory


April, 2006


snowfence 1, snow depth
snow depth (cm)
200
180
160
140
120
100
80
60
40
20
0
-40
-30
-20
-10
0
10
20
30
40
distance from fence (m)
East Transect
West Transect

- How do shrubs that lay down under snow recover from snow loading and rise up again in spring?
- Does recovery from loading require new growth, formation of reaction wood?

Zero time (before release from snow)

Photo by Ken Tape

5 min post release

Photo by Ken Tape

30 min

Photo by Ken Tape

3.3 h

Photo by Ken Tape

24 h

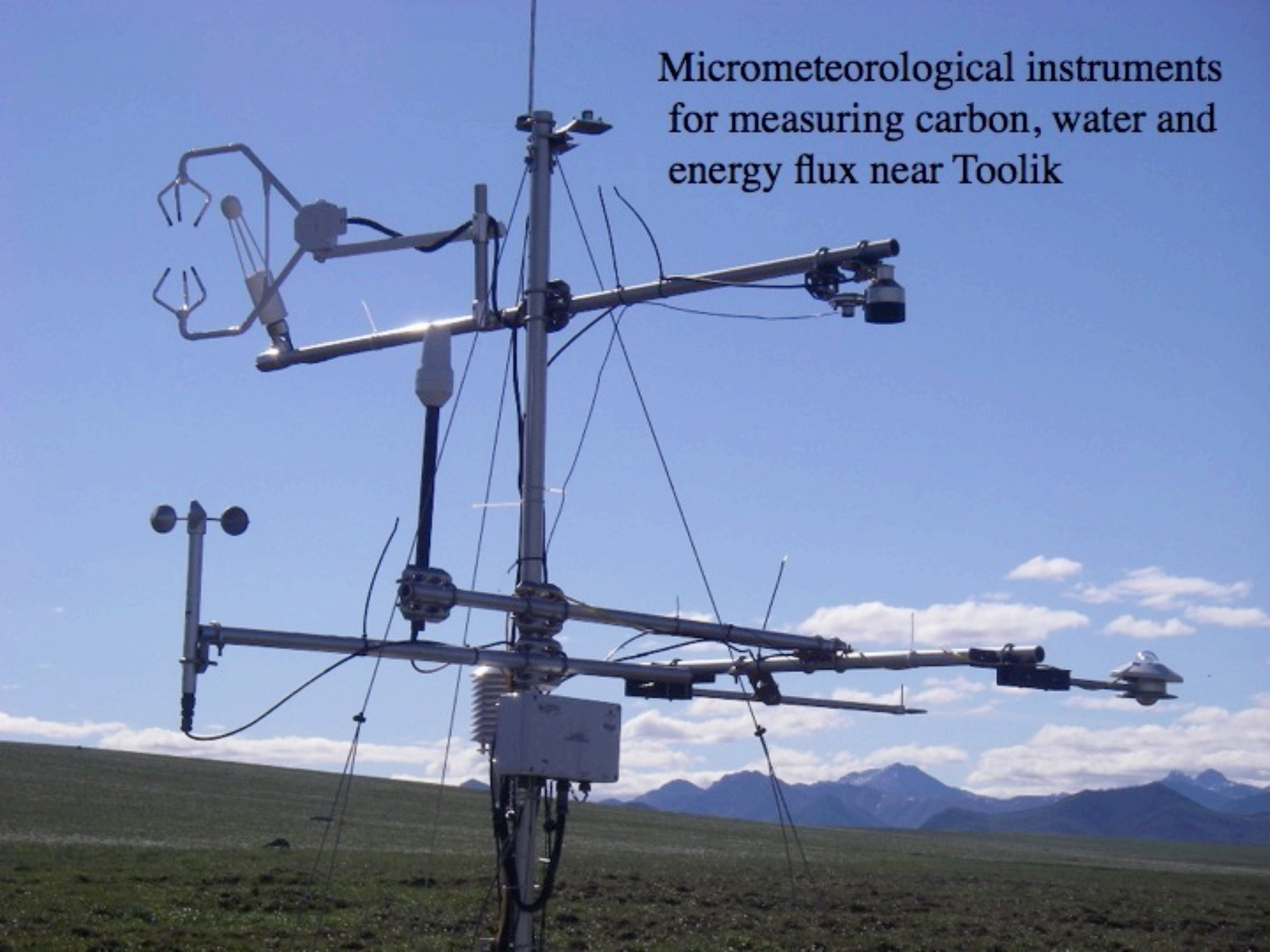
Photo by Ken Tape

- Shrubs rise up quickly; their response is elastic with a retarded component, but is done before new growth begins
- In lab and field experiments, shrubs bend down more under a load at sub-freezing temperatures, raise the load at temperatures above freezing
- This allows them to lie down more easily under the snow when it is cold, and to rise up when it gets warm
- Shrubs that are above the snow suffer more winter mortality, so being under the snow is advantageous

- How are the fluxes of carbon, water, and energy changing across the Arctic as climate warms?
- What drives changes in the seasonal patterns of carbon, water, and energy balance?


Cherskii (Pop. 8,500)
Northeast Science Research Station
Panfilikha River


Abisko (SWE)
Zackenberg (DNK)
Lake Hazen
Boniface River
Cherskii (RUS)
Daring Lake
Baker Lake
Toolik (USA)


Micrometeorological instruments
for measuring carbon, water and
energy flux near Toolik

Field course in Arctic Science for undergraduates and graduate students

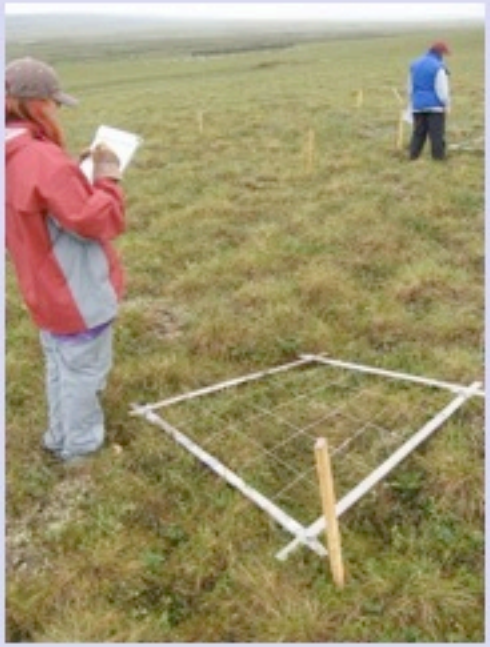
- Measuring carbon flux at a plot scale
- Checking out the ground squirrels near Toolik

Effects of Climate Warming on Above- and Belowground Community Structure

Laura Gough, U. Texas at Arlington

John Moore, Colorado State U.

Effects of Climate Warming on Above- and Belowground Community Structure



Moist Acidic Tussock Tundra

(MAT)

Dry Heath Tundra

(DH)

After Nutrients Added

Moist Acidic Tussock Tundra

(MAT)

Dry Heath Tundra

(DH)

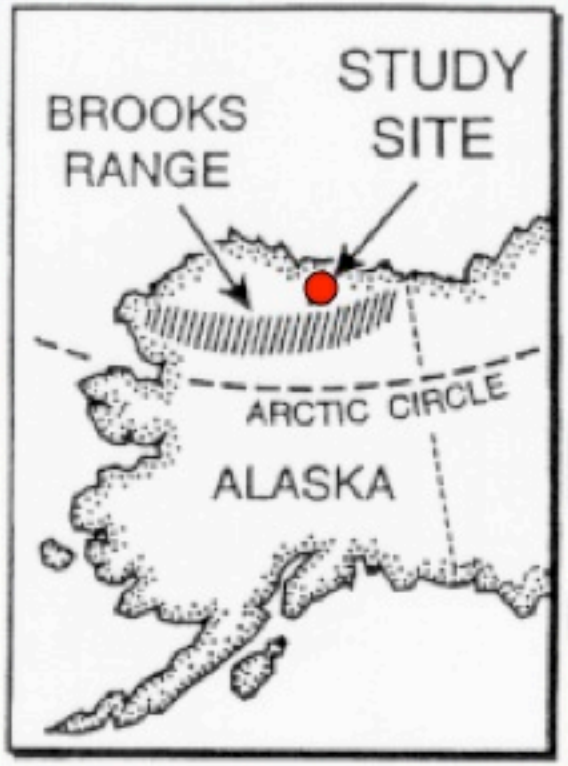
MAT: dwarf birch

(*Betula nana*)

Small Mammals

mostly voles

Caribou

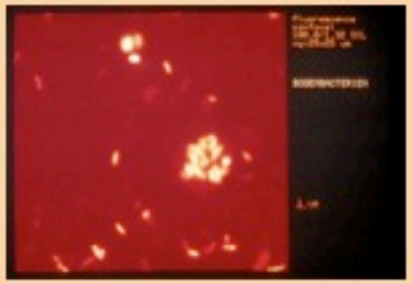


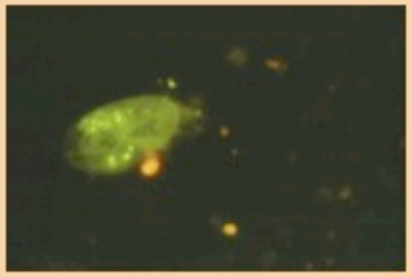
Toolik Lake Alaska

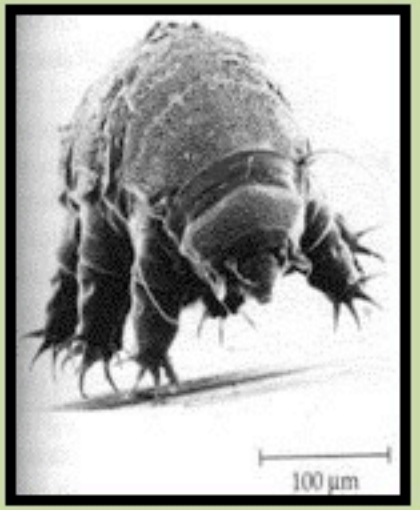
An Arctic Tundra Ecosystem

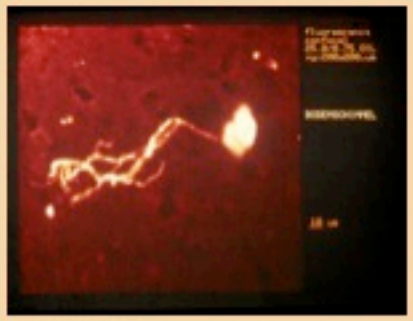
	NPP (g C m^{-2} y^{-1})
Dry Heath	32
Wet Sedge	69
Moist Tussock	156

Soil organisms ...

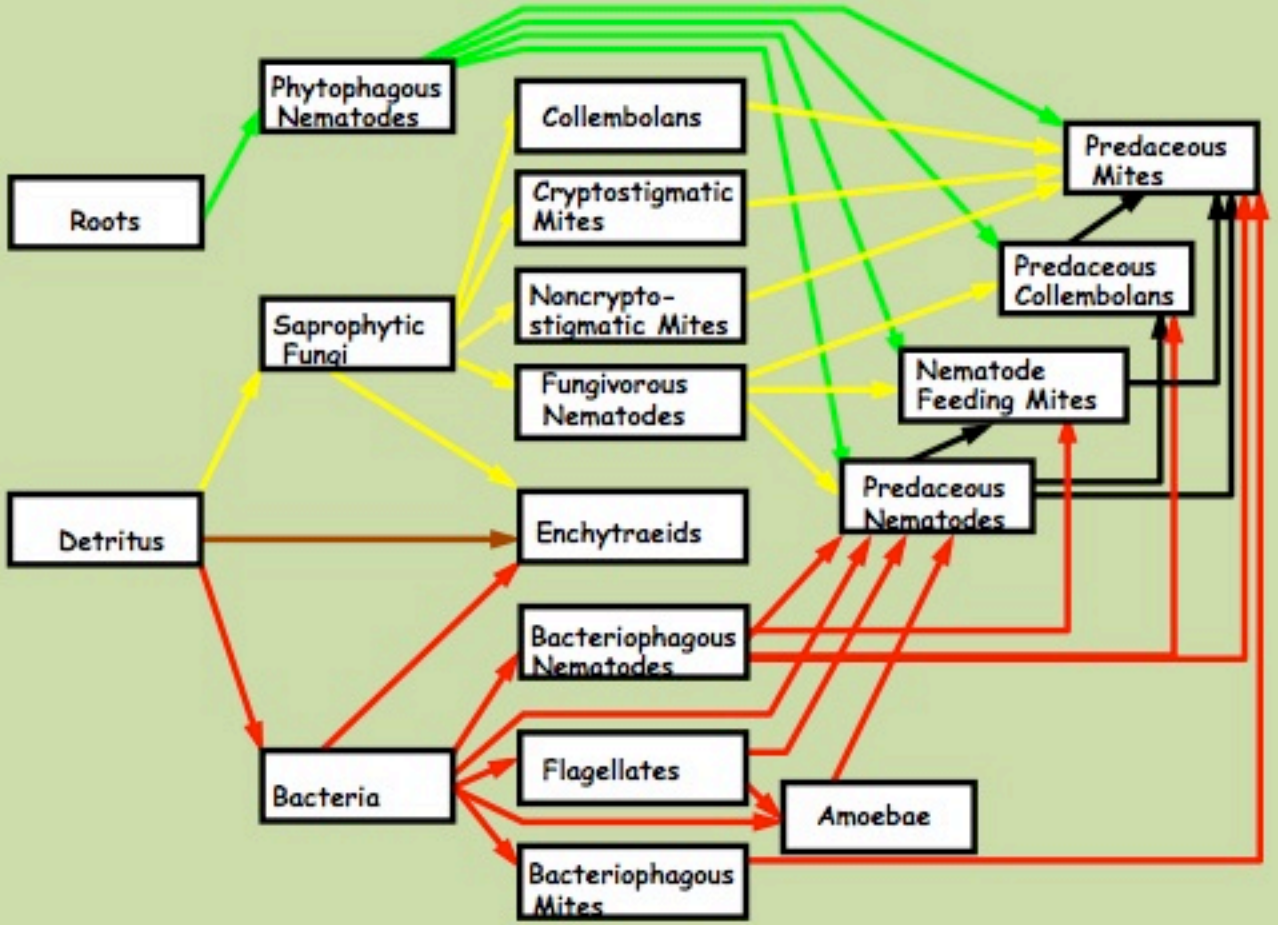








Soil Food Web



Hunt et al., *Biol. Fert. Soils* 1987

Do Nutrients Matter?

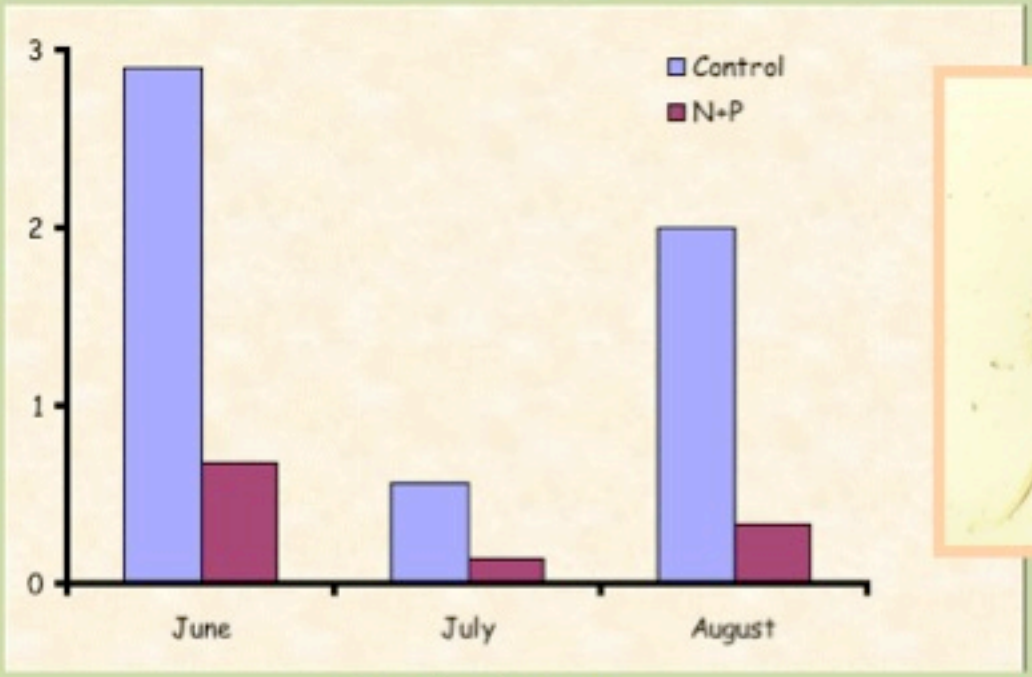
Control

A decade later…

N+P

Shaver *et al. (in sequentia)*

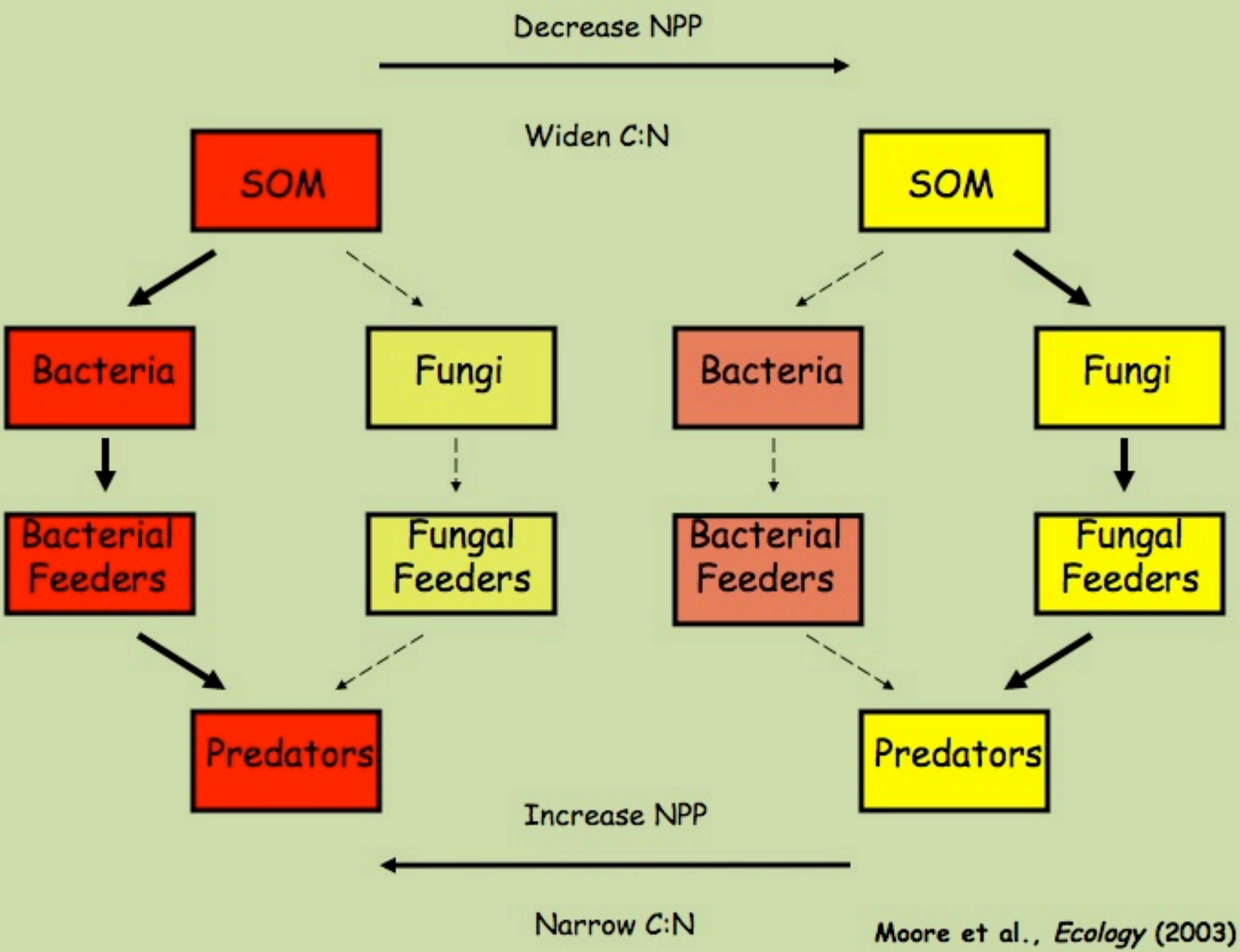
Collembola



Treatment p = 0.0011

Date p = 0.0001

Treatment x Date p = 0.0959



Moore et al., *Ecology* (2003)


Questions?
Remember, you can also ask questions to Cathy and the team at www.polartrec.com!

Check out and register for upcoming events!

21 & 28 July 2008—Jillian Worssam on the USCGC Healy, Bering Sea

8 August 2008—Missy Holzer and team in Svalbard, Norway

Register for these events and watch for others at www.polartrec.com!

Thank You!

For more information, please visit www.polartrec.com

Or Call 907-474-1600

Email: infr@polartrec.com