

**Integrating Research and Education: Biocomplexity
associated with biogeochemical cycles
in arctic frost-boil ecosystems**

[NSF-OPP 0120736](#)

DATE: 8/29/2002
TO: LAII community
FROM: [William Gould](#)
RE: Summer 2002 Field Activities

This report briefly describes the activities of the Arctic Field Ecology class and its integration with the NSF sponsored research "Biocomplexity associated with biogeochemical cycles in arctic frost-boil ecosystems".

Introduction:

Five undergraduate and one graduate student from the [University of Minnesota](#) were enrolled in Arctic Field Ecology this summer. The course was taught by Bill Gould (vegetation ecologist) and Grizelle Gonzalez (soil ecosystem ecologist), with teaching and logistic assistance from UAF graduate student Andrew Borner and [University of Colorado](#) graduate student Lee Turner. The course included travel by road along the Dalton highway, by kayak along the Sagavanirktok River, a visit to the town of Nuiqsut on the Colville River Delta, and a visit to the [Toolik Lake LTER site](#). Course activities took place at treeline on the south side of the Brooks Range, Atigun pass, Galbraith Lake, Toolik Lake, five of the six cryoturbation grid sites (Happy Valley, Sagwon Hills acidic and nonacidic tundra, Franklin Bluffs, and Deadhorse), the mouth of the Sagavanirktok River, and Nuiqsut.

Objectives:

The goals of the course were to instruct students in Arctic natural history and current research themes and findings in Arctic ecology; to introduce students to the research agenda, methods, field sites, and personnel associated the biocomplexity study; and to involve students in a class research project examining biodiversity patterns along the climate and disturbance gradients being investigated in the biocomplexity study.

June 25-28: The beginning of the class coincided with a four day coordinating meeting of the Participants in the [biocomplexity study](#). This was organized by Skip Walker *et al* . and took place at several of the research sites with a summary meeting in Prudhoe Bay. Lee Turner participated in the full four-day meeting and the field class was able to participate in the final two days, meeting the participants at the Deadhorse cryoturbation site and attending the summary meeting in Prudhoe Bay. This gave the students an opportunity to be involved in the interaction of the multidisciplinary research team, to learn more about the study, and to make contacts that might further their education and career objectives.

June 29-July 1: We traveled south to Galbraith Lake along the Dalton Highway to begin the introductory portion of the class *e.g.* familiarizing the students with the patterns and controls on vegetation, soils, wildlife, landforms, and ecosystem processes of the region. We also visited archaeological sites near Atigun Gorge and discussed the human history of the North Slope and of the Arctic in general.

July 2-13: After four days of snow and strong winds at Galbraith Lake we headed to the Slope Mountain DOT site to begin travel along the Sagavanirktok River. Over the next two weeks we typically held class activities during the morning and traveled for a few hours by kayak during the afternoon. We camped along the river, at times within road access so that we could make trips by car to the cryoturbation sites. During this period we visited the cryoturbation sites at Happy Valley, Sagwon, Franklin Bluffs and Deadhorse. We met with Anja Kade at the Sagwon MNT site and she discussed her cryoturbation studies with the class.

A key feature of the course during this period was investigating variation in soil and vegetation along toposequence and climatic gradients. We linked our daily field observations with discussions of recent and past important literature related to climate, substrate, and topographic controls on landscape patterns.

At each of the cryoturbation sites we collected data for a project investigating plant and soil organism diversity patterns on frost boils and interboils. Our sampling involved three 20-meter transects at each site where we measured ground surface profiles, active layer depths, and surface cover (*e.g.* bare, vegetated, or cryptogamic crust) at 10 cm intervals. Additionally, we located five frost boil and five interboil areas along each transect. At each of these locations we measured soil moisture, soil temperature at 10 cm depths, air temperature at 10 cm above the ground surface, vegetation composition within 25 x 25 cm quadrats, obtained soil samples for analyses, and placed pitfall traps for 1-4 days in order to collect surface active soil insects. We sampled soil and vegetation from 75 frost boil and 75 interboil quadrats and collected insects from 90 pitfall traps. Analyses of soil, vegetation, and insects will be conducted at the International Institute of Tropical Forestry in Rio Piedras, Puerto Rico.

July 14-16: We made a three-day excursion to the town of Nuiqsut in order to meet Inupiaq residents of the North Slope and broaden the students' understanding of current land use issues and local history. Most of our activities were impromptu and spontaneous during this visit and students had a chance to interact individually with people from the village. Highlights of the visit were watching Inupiaq as they brought in Harp and Spotted seal, whitefish, Inconnu, and caribou. We got a chance to see people use the traditional *ulu* (curved knife) as they skinned seals. We met with local officials and elders and we will try to establish a more formal interaction with Nuiqsut in subsequent classes. Our goal is to find Inupiaq elders interested in offering instruction to the class, and Inupiaq students that may be interested in participating in the class. We may try to set up a traditional camp near the mouth of the Colville River next summer that will provide an environment conducive to good interactions between our students and Inupiaq elders.

July 16-18: We conducted sampling at the Deadhorse site on the morning of the 17th. We attempted to reach the Howe Island cryoturbation site in the mouth of the Sagavanirktok River in the afternoon. We spent two hours trying to access the oil fields and eventually were given access. The late hour of the day and high winds prevented us from paddling to Howe Island but we spent time in the coastal area and investigated the contrast in vegetation here (subzone C) versus sites further south (subzones D

and E).

July 18-20: We visited the [Toolik Lake LTER site](#). Students were given a tour of the site by Andrew Borner and had their final exam here. Students developed a group proposal over the last week of the course and presented this on July 19th: "Cumulative development impacts on pingo ecosystems in Northern Alaska", a multidisciplinary study involving investigations along a gradient in road, pipeline, and human activity impacts on pingo ecosystems that integrated studies of hydrology, wildlife, and vegetation: They gave an excellent presentation.

July 20: We met with Chien-Lu Ping, Gary Michaelson, and their field class as they investigated a soil pit at a moist nonacidic tundra site near Toolik Lake. Gary had earlier given the class a packet of information (photos, soil profile, physical characteristics, and chemistry descriptions) from soil pits at each of the cryoturbation sites. The packets were very useful and we incorporated these into soil seminars given by Grizelle González earlier in the course. There is potential to integrate the Arctic Field Ecology class more closely with that of Chien-Lu and Gary in the future.

July 21: We returned to Fairbanks to end the course. The integration of Arctic Field Ecology and the cryoturbation research provided an exceptional educational opportunity for the students. I am including their names and email addresses below as they are a good pool of future [REU students](#), graduate students, or field assistants.

- Paul Larson (niceturkeywaffle@hotmail.com)
- Ina Timling (timl0003@umn.edu)
- Keith Crooker (croo0020@tc.umn.edu)
- Beth Kolb (kolb0052@umn.edu)
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Acknowledgements

Thanks from all the Arctic Field Ecology staff to Chien-Lu Ping and Gary Michaelson for their instruction at Toolik; to Skip Walker, Bill Krantz, Howie Epstein, Vlad Romanovsky, Yuri Shur, Gennadiy Tipenko, Anja Kade, and Alexia Kelley for insights offered in the field and at the Prudhoe meeting; to Hilmar Maier, Tako Reynolds, and Christine Martin at the [Alaska Geobotany Center](#); to Marin Kuizenga and Diana Garcia-Novick at [VECO](#); to [OPP](#) and the [National Science Foundation](#) for their support; to the [Toolik Lake staff](#); to Amber Moody; and to David Biesboer and Kristen Murphy at the [University of Minnesota Itasca Field Biology Program](#)

For more information on Arctic Field Ecology:

<http://muskox.com/>

For more information/site photos on our Biocomplexity/ Frost Boil project:

<http://www.geobotany.uaf.edu/cryoturbation/index.shtml>