Trip Report Russia ATLAS project, Kolyma River region, 5-26 Aug 2002

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Objectives:

Four primary objectives were accomplished:

(1) **Characterization of the vegetation at flux tower sites near Cherski.** Stands of vegetation within three of Terry Chapin's flux tower sites on burned areas of various age and a site that has been stripped of vegetation were sampled using Braun-Blanquest sampling procedures. Vegetation was also characterized on an old growth site and a area of steppe grassland on a south facing river bluff.Soil samples were taken from the top 10 cm of soil. Vegetation was also sampled along a toposequence of Mount Rodinka. 8 releves and the Mt. Rodinka transect were sampled in 5 days at Cherski, Aug 8-12

(2) **Bioclimate transect along the east bank of the Kolyma River.** This was to aid in Circumpolar Arctic Vegetation Map. The Kolyma River region is the only other region outside of northern Alaska, where three major arctic bioclimatic subzones are compressed to a narrow belt of less than 180 km from the ocean. The proximity of this region to the North Eastern Science Resarch Station near Cherski, makes logistic support for examining variation across all three Low Arctic subzones (C, D, and E) relatively easy. Although the floristics of the region are fairly well known, there has been no work describing the vegetation.The east

side of the river has Yedoma deposits, presumed loess-derived sediments, making it possible to examine variation in plant communities due to climate without the confounding influence of differences in parent material. Part of the purpose was to check the interpretation of the region on the Circumpolar Arctic Vegetation Map.We traveled in two small boats down the Kolyma River to Ambarchik on the arctic coast. 24 releves were sampled along the transect from Cherski to Medveshy Point.

(3) **Characterization of frost boils.** 10 x 10-m grids of frost boils were mapped at Ambarchik and Kurishka. Air and soil temperature monitoring stations were established at each grid. Vegetation and soils were characterized within 5 microsites at each grid (barren center, rim, troughs, and depressions). A third grid was established at Kurishka. This site was not mapped, but vegeataion and soils were characterized.

(4) **Visit the Earth Cryosphere Laboratory, Moscow.** The purpose of this visit was to consult with personnel at the lab who are mapping the Russian portion of the Circumpolar Arctic Vegetation Map. Two days were spent reviewing the map.

General discussion:

We met Nadya Matveyeva on Aug 7 in Moscow. Nadya is the world's foremost expert on polar desert vegetation and frost-boil vegetation. She has spent most of her life working on the Taimyr Peninsula, and had worked with us earlier on the Canadian Transect in 1999. She was a great help with the flora and her insights regarding frost boils. We flew the same day toward Yakutsk. We were detoured enroute to Yakutsk because smoke from extensive forest fires prevented landing. So as a bonus we saw the very interesting city of Khabarovsk and the Amur River. The next day we flew to Yakutsk and then to Cherski. We stayed at the Northeast Siberia Research Station in Cherski. The station is run by Sergei Zimov with help from his wife Galya and his good friend Sergei Davidov. Zimov has lived in the region for 25 years and is truly an original thinker. Zimov's major ideas regard the influence of wildlife on the evolution of the arctic vegetation. He believes, with good evidence, that the low-arctic tundra biome is a product of the lack of extensive grazers that existed during the Pleistocene. He believes that humans eliminated much of the herbivore fauna and their predators, and that the present-day mossy, sedge-dominated tundra replaced the grass-forb system that covered much of the Arctic during the Pleistocene. Zimov is not a fan of our current tundra. He would like to return extensive herds of siberian horses, bison and muskoxen and introduce Siberian tigers to extensive areas so that the tundra could return to its former productivity. It sounds like a crazy idea, but he is intent on doiing it over a large area of Yakutia, and has a piece of land to start on. He has already introduced horses and moose, and the vegetation seems to be converting to a grassland. He would like to introduce wood bison from Canada with Terry's help. But Zimov is not just a crazy scientist, he is an amazing person that has been able to deal with the Russian beuracracry and build a research station in one of the most remote areas of the globe. He drove a tank across Russia in the middle of winter in order to have an ORV to work on the tundra (the trails left by the tank however are less than desirable impacts). He built an airplane in order to take aerial photographs of his research sites and collect CO2 samples, and has hovercraft for navigating up and down the river, as well as a fleet of boats and other miscellaenous vehicles in various states of repair.

And he is a great person to sit up all night and talk with. He is intimate with the country, hunts to feed himself and his wife, and knows everyone in the region. He's an amazing combination of limitless energy, ideas, and common sense that is needed to stay alive in Siberia during a time of incredible political and economic change.

During the first 5 days we worked mainly on Terry Chapin's forest plots near Cherski, sampling larch stands in various stages of fire succession. We also did an elevation transect on nearby Mt. Rodinka. We also sampled a stand of steppe vegetation near the field station.

We then spent 10 days on a transect along the Kolyma River. We used two small boats and were accompanied by Sergei Zimov and Sergei Davidov. We sampled 24 releves and set up 3 grids along the bioclimate gradient. The big surprises for me were:

(1) Nonacidic tundra in the region is not as well developed as in northern Alaska. Most soil pHs are near 6.0 at the upper boundary of the mineral soil according to S. Davidov. and there are lots of the species found in acidic tundra of northern Alaska The yedoma must be less calcareous than the loess of northern Alaska because there are few calcicoles in the tundra.

(2) The level of disturbance in the tundra is much greater than I expected, mainly because of the reindeer. A family of reindeer herders were camped about 1 km from the Ambarchik climate station, where we stayed, and they invited us into their camp, and we saw the methods they use to herd the animals. They were sorting out some of the sterile males that they use for transporting the camp. And then they moved the next day, so we could examine the fairly severe disturbance associated with the concentrated activities around the camp. The lichens are most severely impacted by the grazing, and the tundra is dominated by willows with a lot of grasses, and *Carex arctisibirica*. There is hardly any *Tomentypnum* or *Sphagnum*. The dominant moss everywhere is *Aulacomium turgidum*, which we have noted in Alaska to be a moss that comes into disturbed acidic areas quickly.

(3) The frost boils seem to grow from hummocks that are closely spaced and elevated, and which are pretty ubiquitous features over large areas. The frost-boils fit the model of frost-boil development described by Chernov and Matveyeva (1996) pretty well. Our coastal plain Alaska sites are wetter and the hummocks don't seem to form in these situations. The very large frost boils that develop on wet sites in Alaska are much more widely spaced than anything we saw in Russia.

(4) The role that grasses play in the forest and tundra systems is much greater than in Alaska. *Calamagrostis neglecta,* and *Arctagrostis latifolia* are important components of the forest understory and *Festuca altaicai* and several other grass species are very abundant on recently burned areas. In the Arctic, *Calamagrostis holmii* and *Arctagrostis latifolia* are quite abundant in the tundra, and disturbed sites, such as that around the Ambarchik meteorlogical station are nearly totally dominated by grasses. Nearly all sedges are excluded in these areas.

At one camp the locals shot a polar bear that came into our camp. They were drunk when we arrived and said it was attacking a dog and threatened to come into the building where we were staying, but it seems that there were other ways to deter it. It was a young bear.

They apologized profusely, most likely they were concerned about negative impressions on foreign scientists and the possibility that we might report them. Nadya was definitely not happy with the situation, and neither was I, although I didn't try to argue with them about the justification of their actions.

For me, it was just great to see Northeast Siberia tundra and larch forests. The tundra is subtly different from that in Alaska in many ways, mainly due to the heavy use by reindeer herders, the different nature of the loess sediments (there is even some question whether or not the yedoma is really loess), and the different flora. It was heartening, however, that the overall structure of the vegetation in response to the bioclimate gradient is properly portrayed by the CAVM. The details of the boundaries will need to be corrected as we better learn the details of the modern climate gradients in different parts of the Arctic. The trip was particularly beneficial for improving the Russian portion of the Circumpolar Arctic Vegetation Map. Conversations with Nadya gave us many insights regarding Taimyr Peninsula, and conversations with Sergei Davidov greatly improved the map in the region of the Kolyma River. The days in Moscow were very useful for the improving the map in the region of West Siberia and the Yamal and Gydan Peninsulas. The research in the vicinity of Cherski and Kolyma River should help considerably in extrapolation of the information from the ATLAS studies. The trip was a real eye-opener, and convinced me that the results of the ATLAS study will be a first approximation only and there is still much to learn about the circumpolar arctic.

Thanks to NSF for providing the supplement to get to Cherski, VECO for providing the logistic support within Russia, and most especially to Sergei and Galya Zimov and Sergei Davidov and the personnel at the Northeast Siberia Science Station who made this an extraordinary experience.