Miriam Jones

Climate Center Proposal, 12 January 2004

Studying the Paleoecology and Paleoclimate of the Kenai Peninsula, Alaska – implications for Carbon Storage Change with Climate Change

Introduction

Plant remains in accumulated peat provide data for reconstructing the ecological record through time. Pollen, spores, seeds, needles, and other macrofossils can be extracted and coupled with radiocarbon dating to build a chronological record of species change found in the region at different time intervals. Variations in plant species and plant communities indicate short- to long-term ecosystem changes. These can be used as proxies for hydrological and climatic changes in both muskegs and lakes. Studying the paleoclimate in coastal Alaska through muskeg (bog)paleoecology and linking it to carbon storage and nutrient cycling will help elucidate past patterns at the landscape scale. Studying the effects of hydrologic differences in bogs and lakes will help us better understand differences in nutrient cycling based on biological productivity. Because bogs have less water through- flow than most lakes, production within peatlands is limited by low temperatures, low oxygen, and low pH. The anaerobic conditions in the soils limit primary productivity and slow decomposition. These patterns can be linked to landscape history by looking at climate and nutrient changes in nearby lakes. Paired with LOI (loss-on-ignition) and bulk density of the sediments, resulting in percent organic content and carbon content, we can understand how carbon accumulation changes with ecological and climatological changes over time in both bogs and lakes. Past carbon storage in relation to past climate is important for understanding future carbon storage at high latitudes with climate change.

The lowlands of the Kenai Peninsula of south-central Alaska provide excellent study sites for examining the paleoecology because of relatively high peat accumulation and sensitivity of the species to precipitation. Previous paleoecological studies in this area have shown specific species migration patterns since deglaciation (Ager, 1998). While Ager discusses *Picea spp.* (spruce) in his paper, he does not differentiate between the three species of spruce (*Picea glauca, P. sitchensis, P. mariana)* that are found on the Kenai Peninsula. *P. glauca* and *P. mariana* have similar climatic tolerance for mean January and mean July annual temperatures and precipitation, but they occupy different ecological habitats (Ager, 1998). Picea mariana requires wetter soils, while Picea glauca prefers well-drained sites.Sitka spruce (*P. sitchensis), a more maritime species requiring even more moisture,* is found at its northern boundary on the Kenai Peninsula, Sometime in the more recent past, however, it has hybridized with *P. glauca* (white spruce).