

National Park Service
Research Report

Park Name: Kobuk Valley National Park
Activity: Research
Subject: Geology - General

Report Year: 1996
Project Title: Past and Future in an Alaskan Desert: Research in the Kobuk Sand Dunes

Investigator(s): Daniel H. Mann
UAF, Fairbanks, AK 99775

Phone: (907) 474-7925
Fax :
Email:

Coinvestigator: Patricia A. Heiser (907) 474-7925

Objective: To understand how geomorphic and geological processes interact with climate to control the past and present extent of the Kobuk Dunes.

Findings: Work in Progress:
Dune Field History: In late summer 1996 we visited the western margin of the Great Kobuk Sand Dunes. Tramping through the tangle of old forest fire debris west of Kavet Creek we discovered that the ancient Kobuk dune field once extended across Kavet Creek and downstream along the south side of the Kobuk River for at least 20km. This area is outside the region of previous geomorphic mapping and represents a large addition to the previously known extent of the ancient Kobuk sand sea. Work in the dunes themselves revealed that a forested area of approximately 10km squared at the northwestern corner of the Great Kobuk dunes was buried by dunes after 4000 years ago. Carbon 14 dates on a thick forest soil now buried except in interdune swales tend to become younger towards the dune margin, suggesting progressive burial as the dunes expanded to the northwest. This forest was composed of spruce and birch trees. Mammal bones and human stone artifacts occur at several sites. Two stratigraphic sections exposed along Kavet Creek record the burial of former floodplains under encroaching dunes after 1400 yr B.P. We estimate a rate of dune spread of approximately 1 km per 1000 years. This rate is surprisingly slow but consistent with comparisons of aerial photography from 1958, 1978 and the location of the dune margin today.

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Fire History: Wild fires are common in the Kobuk River valley. We think they are potential triggers for widespread dune reactivation. In September 1996, we obtained 500 tree-ring cores from white spruce growing in fire-break areas along the dune margin. These cores are now being mounted on wooden blocks, finely sanded to reveal the tree rings, and counted. The age of these 500 trees will describe the age structure of the forest and reveal intervals of tree establishment. In interior Alaska, white spruce is established mainly after fires and so its population-age structure records the timing of past fires. Our record will provide the first complete description of fire history in the area of the dunes. Tree-ring counts in the field revealed that some white spruce are very old; the oldest was 380 years. Furthermore the ring widths are highly variable, suggesting these trees are highly sensitive to climate change and can provide a valuable record of changes in climate over the last 4 centuries. The same ring-marker years, distinctive sequences of rings formed under unusual climatic conditions, occur in the Kobuk-dune trees as in trees near Fairbanks. This is exciting because these Fairbanks trees show sensitive responses to summer drought. a dendrochronological record of summer drought at the dunes could have direct relevance to the history of dune activity.

Reports Produced: (None)