

Integrated Paleoenvironmental Reconstruction of the Late Cretaceous (Maastrichtian) Lower Cantwell Formation near Sable Mountain, Denali National Park, Alaska

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The Lower Cantwell Formation in southcentral Alaska is a late Cretaceous (Campanian/Maastrichtian), up to 4000m thick, non-marine to marginal marine sequence that was deposited along the suture zone during the final accretion of the Wrangellia Terrane to the North American continent. In the Sable Mountain area in Denali National Park, a rich fossil record consisting of vertebrate and invertebrate tracks and plant megafossils is presently evaluated for its paleontological and paleoecological significance. Whereas previous studies have focused on the tectono-sedimentary history of the Cantwell Basin, this study aims to characterize the sedimentary subenvironments and evaluate the paleoenvironmental conditions for this high-latitude basin.

About 2500m of section, measured in detail, consist of numerous successions of conglomerate, sandstone, siltstone, mudstone and occasional thin coal seams. The predominantly tabular, coarser-grained beds exhibit low interconnectedness as grain size decreases laterally and vertically. Conglomerates are both massive and stratified and frequently interbedded with fine-grained sandstone. The fabric is matrix-dominated and consists of angular grains; clasts have a polymictic lithology, are poorly sorted and show varying degrees of abrasion suggesting a short transport distance from the source region and frequent reworking under hyperconcentrated streamflow and mass-wasting conditions. Finer-grained rocks make up the larger fraction in outcrop; beds are typically tabular and frequently interbedded. Many display relief at the boundaries and evidence of diasturbance and weak pedogenic modification. Rocks have a dark grey to black color, are well-indurated, organic-rich and occasionally ferruginous. Facies are interpreted to represent a variety of alluvial subenvironments located in close proximity: braided channel, sandy channel, crevasse splay, sheetflood, floodplain, and lacustrine. The depositional setting is interpreted as a distal alluvial fan system with interlaced deposits of an axially braided river system.

The fossils occur predominantly at depositional boundaries and often form assemblages within distinct facies associations. Vertebrate fossils comprise the tracks of several groups of dinosaurs, birds, and pterosaurs. Invertebrate tracks include freshwater bivalve shells, ostracode and gastropod trails, crayfish burrows, beetle and mole cricket tracks, wood borings and feeding traces on angiosperm leaves. Plant fossils consist of fern fronds, the shoots, cones and leaves of cupressaceous, taxodiaceous, and pinaceous conifers, and the leaves of a variety of monocots and dicot angiosperms of nymphaealean, menispermoid, trochodendroid, platanoid and higher hamamelid affinities. Taxa suggest a Maastrichtian age.

The sporadic fossil occurrences and the incipient paleosols indicate short-term post-depositional modification in a rapidly aggrading and generally wet floodplain. We attribute this to high accommodation in a rapidly subsiding basin.