Sedimentology and taphonomy of the plant-bearing beds of the Colwell Creek Pond site in the Early Permian Clear Fork Group of north-central Texas, USA*

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The Clear Fork Group is a 400 m thick, fluvio-continental unit that was deposited on the Eastern Shelf of the Midland Basin. Colwell Creek Pond is a fossiliferous site within the informal middle unit which provides a rare opportunity to evaluate the environments in which plants grew and the taphonomic conditions responsible for the well-preserved plant leaves.

Two partially preserved channel bodies are present. Storey 1 is a 5 m deep channel cut with a width: thickness ratio of 13:1. A thin basal channel deposit (50 cm) of pebbly conglomerate, ripple cross-laminated and planarstratified sandstone rests erosionally on red massive siltstones interpreted as paleosols; the sandstone contains diplichnitid trackways. Above is a 2 m thick laminated claystone with varicoloured laminae, loop bedding and microfaults. Each lamina ranges from 0.3 cm to 2 cm in thickness and is normally graded from coarse silt to clay with non-erosive, parallel-planar bedding surfaces. XRD and TOC analysis indicates the presence of chlorite, illite and other detrital grains but no carbonate or evaporite minerals, with negligible organic carbon. The storey is capped by 2.9 m of massive claystone with root traces and abundant slickensides below the erosive base of Storey 2, a sheet-like channel body with stacked fining-upward cycles.

The Storey 1 channel was abruptly abandoned shortly after incision. Sediments were delivered by slow-moving density underflows that laid down graded laminae. The upward change to rooted claystone indicates shallowing due to sedimentation and, perhaps, declining water levels. Similar well laminated abandonment fills are common in the Clear Fork Group but rare in fluvial units elsewhere, and imply a lack of bioturbating organisms.

Plant fragments are preserved in the laminated claystone, and probably settled from suspension after transport by the density underflows. Well-preserved fronds of the conifer *Walchia piniformis*, the cycadophyte *Taeniopteris* spp. and the peltasperm *Auritifolia waggoneri* were probably derived from the adjacent riparian zone. They were preserved as 3D goethite petrifactions which suggest that early mineralization, probably promoted by microorganisms, arrested decay and aided preservation.

The abundance of exceptionally preserved plants might suggest a well vegetated landscape and relatively humid setting, as supported also by the detrital nature of the laminae. However, within the Clear Fork Group, the lack of upright trees, the scarcity of logs, and the presence of laminated, non-bioturbated fines suggest a relatively arid setting. Early biomineralization and exceptional preservation of fronds may have imposed a taphonomic bias on the assemblage.

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