

The Paradox of coal in an active depocenter: The Westphalian of the Cumberland Basin

J.H. Calder

*Department of Geology, Dalhousie University, Halifax, Nova Scotia B3H 3J5
and Nova Scotia Department of Mines and Energy, Halifax, Nova Scotia B3J 2X1*

During the Westphalian B, the Cumberland Basin was the major depocenter of the Maritimes Basin. The high rate of sedimentation and the proximity of coals to both marginal alluvial-fan and major channel-belt deposits is seemingly at odds with prevailing theories that thick, low-ash ("economic") coals could not have formed temporally or spatially near such active deposystems. The >1 km-thick basin-fill sequence, comprising the coal-bearing Springhill Mines Formation and underlying, conglomeratic Polly Brook Formation, records a decelerating rate of subsidence. The formation of major peat-forming ecosystems (mires) was possible only during an optimal subsidence window coincident with alluvial-fan maturity and multi-storying of fluvial-sandstone bodies. The distribution of the peat mires was determined by groundwater systems, largely a tectono-geographic function and an allogenic control. Of primary importance was the recharge supplied to the piedmont by the mature coalesced fans at the southern basin margin, upon which the mires become increasingly dependent as basin infilling proceeded and regional groundwater levels declined.

The No. 3 seam of the Springhill coalfield has been studied in the context of a peat-forming ecosystem, using an interdisciplinary approach incorporating coal petrography, sedimentology, palynology and geochemistry. The seam developed as a groundwater influenced (rheotrophic), nutrient-rich peatland. A high degree of biochemical gelification, corrosion of miospores and formation of pyritic sulphur resulted from the high pH of the mire. The peat mire evolved by two distinct autogenic mechanisms: terrestrialization and palludification. The former resulted in an upward succession of mire types from limnic --? floating swamp --> forest swamp --> fen --> bog forest as the mire tended toward more ombrotrophic (rainfall-sourced) conditions. The latter mechanism occurred at the piedmont (southern) margin, where ephemeral sheetflow from distal alluvial fans was dispersed, dammed and invaded by the forest swamp vegetation, resulting in lateral accretion toward the piedmont. Within the allowable subsidence window, rheotrophic peatlands of the southern Cumberland Basin developed largely through these autogenic processes.