

developments would have promoted in turn the evolution of plants in disturbed riparian zones and stable floodplains and the diversification of soil types and soil-forming organisms. Aqueous vertebrates and invertebrates may have flourished in channels rich in woody debris and scour pools. Complex feedbacks would have operated between rivers, plants, animals, and soils, but have yet to be systematically explored.

The Paleozoic development of fluvial systems as terrestrial vegetation evolved, and implications for organic evolution

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A range of river styles and avulsion strategies (channel breakout and relocation) arose over 150 million years from the Ordovician to the Pennsylvanian, when rivers diversified as terrestrial vegetation evolved. Cambrian and Ordovician rivers were wide, shallow sandbed systems, in which avulsion may have been largely nodal as rivers fanned out below upland exit points. Meandering single-thread channels appeared in the latest Silurian, as indicated by heterolithic lateral-accretion deposits, increasing to >30% of preserved fluvial rock units by the late Devonian. This change accords with the incoming of rooted vegetation, which stabilized river banks and promoted systematic channel migration. Within such sinuous channels, local neck and chute cutoff would have become prominent.

From the Pennsylvanian onwards, strategies for dryland colonization, especially by early conifers, lead to increased vegetation cover, enhanced root systems, and abundant large woody debris. These changes probably account for the rise of narrow channels with stable banks, which constitute >10% of fluvial units by the end of the Pennsylvanian. Some examples were probably anabranching. Within Pennsylvanian braided-river deposits, evidence of deep channels with abundant wood and log jams suggest that island-braided or wandering systems had become common. In contrast to many modern rivers from which woody debris has been removed, log jams may have greatly influenced avulsion in these systems.

By the end of the Pennsylvanian, alluvial plains would have had far more active and abandoned channels per unit area, a greater length of riparian corridors, and a wide range of avulsive strategies. Forced by vegetation, these fluvial