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Mass extinctions, recovery and resilience

Correlated plant diversity and climate in North America during Earth system succession following the K-Pg mass extinction

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Western North America preserves a remarkable terrestrial record across the Cretaceous-Paleogene (K-Pg) boundary and provides an excellent framework in which to examine short- and long-term climatic, floral, and faunal change pre- and post- K-Pg mass extinction. Mega- and palynofloras from the Williston and Denver Basins (North Dakota and Colorado, respectively) suggest that ∼50% of angiosperm leaf species and ∼30% of palynomorph species disappear at the K-Pg boundary, demonstrating an instantaneous extinction and little evidence of preceding ecosystem stress. Plants from the immediate aftermath of the K-Pg extinction indicate rapid forest recovery. During this time, pulsed climatic warming correlates with increased plant species richness and the immigration of energy-rich fruit types, both of which may have supported the diversification of mammals in the earliest Paleocene. While these data suggest plants diversified in the wake of the K-Pg event, most megafloral data suggest forest diversity in North America did not recover until the Eocene, ∼10 Ma after the K-Pg boundary. However, the hyper-diverse Castle Rock rainforest (63.8 Ma) in the Denver Basin changed this paradigm. Continued analyses of this flora, particularly in the context of newer discoveries, give insight into food web recovery after the K-Pg extinction. Cast in the context of Earth system succession (global ecological succession following mass extinction events), these data suggest a staged and intrinsically linked pattern of recovery of the global ecosystem.